SCIENTIFIC AMERICAN

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Vol. XCVII.—No. 21.
ESTABLISHED 1845.

NEW YORK, NOVEMBER 23, 1907.

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SCIENTIFIC AMERICAN
ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York

FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States or Mexico..... $3.00
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One copy, one year, to any foreign country, postage prepaid. £0 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS

Scientific American (Established 1845).....$3.00 a year
Scientific American Supplement (Established 1876)..... 5.00 "
American Homes and Gardens ..... 3.00 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.
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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, NOVEMBER 23, 1907.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

LABOR SAVING AT PANAMA.

We all understand that the use of modern machinery has resulted in much saving of labor; but it takes such figures as have recently been published in the Canal Record by Mr. Borlich, Division Engineer in the Culebra cut, to give us an adequate idea as to just how great this saving of labor can be. The figures given are based upon the work accomplished during the final month of the last dry season, when material was taken out at the rate of 18,600 cubic yards per steam shovel per month. A comparison is made between the number of men actually required to do a given amount of work with the use of machines and the number of men that would be required were the excavation done by hand labor alone. The use of the 70-ton and 95-ton steam shovels requires the service of only 298 laborers, including the men used in moving up the shovel and clearing the track, and the engineer and trainmen. On the supposition that one good man could load 6 cubic yards in 8 hours, to move the 815,270 cubic yards per month would call for the work of 5,456 laborers, a saving of over 5,000 men from the steam shovels alone.

Another important saving in the use of the steam shovel is connected with the question of drilling and blasting the ground into such sizes and weights as men can load on the cars. A man can handle a rock of from 150 to 200 pounds weight; a steam shovel will handle rock weighing 21,000 pounds. In breaking up the material into sizes that can be handled by men, two or three times as much drilling is necessary as to break it up for the shovels. While one-third of a pound of explosives will blast out a cubic yard of material suitable for a steam shovel to handle, a pound of explosive must be used to break the same amount for hand labor. Hence, if the loading were done by hand, instead of 700 to 800 men as at present, it would take from 2,100 to 2,400 men; and, instead of using, as in the month of March last, 260,000 pounds of explosive for an output of 815,270 cubic yards, it would have been necessary to use 780,000 pounds.

A large part of the labor cost of excavating the Culebra cut is due to the work of disposing of the excavated material on selected dumping grounds, on to which the material is hauled over railroad tracks. After the track is once laid, it has to be continually shifted over to the edge of the dump. This is done by what is known as a track-throwing machine, which will throw over a mile of track a distance of 9 feet in eight hours. This machine is handled by three men and six laborers, who do the same work in the same time that would necessitate the employment of 500 or 600 hand laborers. When the trainload of material has been hauled out to the dump, there comes the important question of unloading, and this is done by means of a special machine which has made a record at Culebra of unloading 5,000 cubic yards from sixteen trains in eight hours. At this rate, seven unloaders and plows would take care of the daily output in the month of March last; and this would mean that 28 white men and 42 laborers could unload 32,000 cubic yards a day. A man with a shovel could unload only 12 cubic yards a day, upon which basis we find that, by the old methods of unloading by hand, it would require 2,660 laborers and 100 white foremen to do as much as 28 white men and 43 laborers and firemen, employed on mechanical unloading. After the material has been plowed off the cars, it is pushed away from the track by mechanical spreaders, which distribute the material from 9 to 12 feet out from the track. To accomplish this work by hand would involve the use of 3,000 laborers, as against 8 machines, 16 white men, and 24 laborers and firemen. A comparison of the train service of the French, as used twenty-five years ago for hauling the material out to dump, and the service now in operation at Panama, shows also a remarkable gain in efficiency. This comparison is, of course, no reflection on the French methods, as the development in the size and capacity of trains during the last quarter century has been extraordinary. The standard engine used by the French, and rebuilt by us, hauls a dozen four-yard dump cars, or a train carrying 48 cubic yards of material. Our engines haul 20 Western dump cars of 12 yards capacity each, or 240 cubic yards per train; or they will haul 17 flat cars of 18 cubic yards capacity; a total of 306 cubic yards per train. Therefore, to haul our present output of 32,000 cubic yards daily, it takes 666 French trains as against 133 trains of Western dumps, or 104 trains of flat cars of our American equipment. In a general comparison of results with the work done twenty-five years ago by the French, which Mr. Bolich is careful to state were the methods in vogue twenty years ago on similar work in the United States, we find that with a total of 7,000 men, superintendents, timekeepers, laborers, etc., we took out of the Culebra cut in March last 815,270 cubic yards. At the height of their operations the French took out a maximum of 282,528 cubic yards from the Culebra cut in one month, with the employment of from 16,000 to 18,000 laborers alone, not including superintendents, foremen, etc. Probably of this number of laborers about fifty per cent, or 9,000, was the efficient working force. The results per month, per laborer, work out as 32 cubic yards under the French, as against 116 cubic yards per man per month, under our present administration.

OUR NATIONAL WASTEFULNESS.

The Geological Survey is sending out some most timely and important bulletins. It recently issued a warning to the people in regard to the indiscriminate and unscientific use of reinforced concrete in building. One of its latest bulletins calls attention to our wastefulness in deforestation. It shows that we allow more timber to be destroyed every year by preventable fires than is used in all the lumbering industries. It draws attention also to the fact that there is an enormous amount of coal left and lost in the mines because of reckless processes of mining.

The size of our country and its enormous natural resources have led us to believe that many things were inexhaustible, which as a matter of fact are being utterly and ruthlessly wasted at a most extravagant and foolish rate. Our people have developed habits of prodigality which, in a country less lavishly favored by nature, would spell ultimate national bankruptcy. In the matter of fires, for instance, we have reached the point where we really expect and plan for terrific losses. As an example, Washington's record which has just been completed, shows that there were 470 alarms of fire in the year, resulting in damage of only $250,000. This is one of the lowest and most satisfactory records attained by any city in the land; yet these fires have inflicted a damage, small as we believe it to be, just 350 per cent greater than that suffered by the average of sixteen European cities of equal size.

Incidentally, all the fire adjustment and the other accompaniments of the San Francisco disaster have been tabulated and arranged; and it now transpires that what was supposed to be a total damage of about $350,000,000 amounts to much nearer $600,000,000. Only $200,000,000 can be properly charged up to insurance, and, therefore, the country has suffered a total wiping out of existence, an obliteration of property, to the amount of $400,000,000 by that one fire. This is a matter worthy of our most serious consideration. It should teach us to build so as to make impossible the recurrence of such an awful conflagration, a recurrence that is imminently possible now in several cities, notably New Orleans, Boston, and Philadelphia.

COMMERCE ON THE GREAT LAKES.

Commercial movements on the Great Lakes during August, 1907, as measured by the volume of shipments from the various lake ports, attained a total of 12,597,866 net tons—the largest monthly total recorded by the Bureau of Statistics, Department of Commerce and Labor, for any summer month. Shipments for August are about 10 per cent larger in volume than the shipments for July of this year, over 15 per cent larger than the corresponding figures for 1906, and over 33 per cent in excess of the 1905 figures, while figures for the eight months of the year, 50,441,647 net tons, are about 14 per cent and 24 per cent larger than the corresponding 1906 and 1905 shipments. The large tonnage of iron ore and coal moved during the month is responsible for the growth in the total shipments recorded for the month as compared with August, 1906.

The iron-ore shipments, mainly from the Lake Superior ports of Ashland, Duluth, Marquette, Superior, Two Harbors, and the Lake Michigan port of Escanaba, aggregated 6,950,343 gross tons, compared with 5,533,442 gross tons reported for August, 1906, and 6,228,230 gross tons, the earlier record figure, shipped during June, 1907. The shipments of iron ore for the season up to September 1 amounted to 24,466,231 gross tons, which is over 2½ million tons in excess of the corresponding 1906 figures. The favorable total might have been even larger were it not for the interruption of ore mining and traffic during July and the still continuing shortage of the labor supply at some of the more important mines in the Lake Superior district.

Shipments of soft coal for the month, mainly from Lake Erie ports, to the head of the lakes and Milwaukee, 2,045,531 net tons, while about 7 per cent larger than the August, 1906, figures, are, however, more than half a million tons below the July shipments. This decrease is to be accounted for mainly by the fact that many ore freighters which during the preceding month had been engaged in the carrying of grain and coal resumed the transportation of iron ore and could not afford to incur the delay of loading coal for the return trip west. The total shipments for the eight months of the year, 9,798,209 net tons, are over 30 per cent larger than the corresponding 1906 figures. Shipments of hard coal during the month, mainly from Buffalo, 555,828 tons, were, on the other hand, larger than the July figures and somewhat below the corresponding August, 1906, figures, though shipments for the eight months, 2,309,556 net tons, are over 40 per cent in excess of like 1906 shipments.

Wheat shipments for the month, mainly from Duluth, Chicago, and Superior, 4,581,482 bushels, were about 20 per cent below the August, 1906, figures, while the total for the season, 24,916,711 bushels, was about 56 per cent in excess of the corresponding 1906 figures. Under the general head of "grain" the largest decrease in shipments is shown by oats, the figures for the month, 1,157,074 bushels, being about 60 per cent below the August, 1906, figures, while shipments for the season, 15,725,939 bushels, are also considerably below the 1906 shipments of 25,079,189 bushels. Flour shipments for the month, chiefly from Milwaukee, Superior, Chicago, and Duluth, 145,944 net tons, were about 19 per cent below the August, 1906, figures, while the total for the eight months, 706,403 net tons, was slightly above the corresponding 1906 total. Of the Lake Erie ports, to which the flour is mainly shipped, Buffalo took by far the largest share, though considerable quantities of flour were also handled at Erie, Pa.

Shipments of lumber during the month, 198,105,000 feet, while in excess of the July figures, show a smaller total as compared with the corresponding 1906 figures. Lumber shipments for the season, 898,269,000 feet, were about 19 per cent less than the corresponding 1906 figures.

The figures of copper shipments, mainly from upper Michigan mines, 8,352 gross tons, show a decrease of about 50 per cent, both as compared with the preceding month's figures as well as the figures of August, 1906, and reflect to some extent the present unsatisfactory state of the copper market. Figures for the current season, 55,648 net tons shipped, are about 25 per cent below the corresponding 1906 figures of 74,468 net tons.

The shipments during the month of unclassed or package freight, 925,965 net tons, on the other hand, show a considerable increase over August, 1906, figures of 801,283, larger shipments being credited to Milwaukee, Cleveland, and Sandusky, while shipments from Buffalo, Duluth, and Sault Ste. Marie show smaller figures than a year ago. The total for the eight months, 4,278,010 net tons, is about 15 per cent in excess of the corresponding 1906 figures.

About two-thirds of the total merchandise tonnage shipped during the month, viz., 8,544,833 net tons, passed through the canal at Sault Ste. Marie. Of the latter figure, 6,697,307 net tons represented an eastbound and 1,847,526 a westbound movement. As compared with the figures of July traffic, the August figures show an improvement by 1,351,597 net tons, due exclusively to the larger figures of the eastbound iron-ore movement, which had fallen off considerably during the previous month, owing to the strike of the iron-ore workers in the Lake Superior region. The iron-ore movement through the canals, 6,120,880 net tons, was 17 per cent in excess of the corresponding 1906 and almost 30 per cent in excess of the August, 1905, movement.

Other important items of the eastbound movement for the month were: Wheat, 7,312,829 bushels; other grain, 3,123,216 bushels; flour, 850,935 barrels, and lumber, 99,889,000 feet. The decrease of wheat and other grain movements as compared with July figures is quite notable, though this decrease is probably due, to a large extent, to smaller shipments of Canadian wheat. Of the total westbound traffic passing through the canals during the month, almost 80 per cent, viz., 1,448,467 net tons, was represented by soft coal and 204,589 n t tons by hard coal.

The total number of vessel passages through the canals during August—3,013—is smaller than the number recorded for August, 1906 and 1905—3,240 and 3,088, respectively—though the tonnage of the vessels locked through the canals—6,352,462—is about 11 per cent in excess of the corresponding 1906, and 26 per cent in excess of the corresponding 1905 figures.

The total freight tonnage which passed through the

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canals during the current season—33,526,388 net tons—is largely in excess of the corresponding 1906 and 1905 totals—29,954,278 and 26,164,799 net tons, respectively—while the corresponding figures of vessel movements are 12,178 vessels of 25,155,715 net tons register for the current season, as compared with 13,691 vessels of 24,097,454 net tons for the 1906 season and 13,077 vessels of 21,710,816 net tons for the 1905 season.

LOGGING IN THE NORTHWEST.

BY RAYMOND M'BRIDE.

The picturesque lumber regions of the North and Northwest, which once produced most of the lumber supply, are now almost destitute of pine and cedar, the woods which once made them famous, and are cutting timber formerly despised. The well-known logging scenes of the New England States will live only in pictures and history, and when the supply in the northern Minnesota, Michigan, and Wisconsin forests is exhausted, there is only the Pacific slope on which to depend on the American side. Across the Great Lakes on the Canadian side lies one of the largest timber reserves in the world. There is a great deal of the timber land of Canada which has not been surveyed yet, so, in spite of the tariff imposed, it is not unlikely that we will be able to draw from Canada for many years after our own supply is exhausted. In fact, much timber cut on the other side of the line has been shipped to this country. It is said that there is a timber belt of at least three thousand miles in Canada. Estimating the amount of timber still standing in the United States, and that which we could draw from our neighbor country, it will be nearly a century before a substitute will be necessary.

Of course the Forestry Department is not idle in the meantime, and active steps are being taken to maintain the reserves and plant new trees.

When the immensity of the industry forces itself upon the attention, it is little wonder that one is interested in the men who do the actual work.

Early in the fall the lumberman sends out his "tote teams," with supplies to last for the season, from the centers of northern Michigan, Wisconsin, and Minnesota, and he gathers a heterogeneous lot of men, known as "lumber jacks," comprising men of almost every nation under the sun, who leave civilized life, and go back close to "nature's heart" and to labor as did their forefathers in the days before luxuries warped their strength.

Their work, in spite of the many labor-saving devices of the day, is that of the primitive man. The discipline of the camp life is rigid. The men are up at four o'clock in the morning, and work from dawn until dark. At night their lights are out at nine. There are no holidays except Sundays. No liquor is sold or allowed to be used in the lumber camp.

The cook and his assistants are the first out in the morning, and have breakfast ready as soon as the men are up. The menu of the camp is very different from that of a few years ago. Now coffee, sugar, condensed milk and cream, unknown luxuries to the camp of even twenty years ago, are daily staples.

Their hard outdoor life strengthens these men physically, and when one sees a large crowd of them eating their dinner in the open with all the gusto of a schoolboy, while the temperature is sixty degrees below freezing, one is disposed to envy them. The plan of bringing out the midday meal to the men, instead of having them leave their work and trudge back to camp, is a recent idea and saves much time, besides being very pleasing to the men. The cook, with his "runabout," brings the dinner, "red hot," to the nearest opening, or clearing space, summons the men with his whistle, and they sit about on logs or on the snow and partake of dinner utterly disregarding the weather.

It is at the evening meal that you see the men at their best. They relax and thoroughly enjoy themselves. After supper they retire to the bunk-house and smoke.

One might feel a little "finical" about sleeping in a room after fifty or sixty ill-smelling pipes of all sorts and conditions had been filled with tobacco, the odor of which baffles description, but this, like eating out of doors with the thermometer thirty degrees below zero, is an acquired taste.

It is only natural that there should be all kinds of men in a camp—garrulous, noisy men; sullen, morose, and reticent men. Sometimes sickness or death reveals the fact that a man who in camp is known as John Smith really was given a name quite different when he came into the world, and perhaps sold his birthright for drink, crime, or for some other reason. A camp is usually loyal though, and John Smith he remains to the end of the chapter if he so desires. Then there is the born entertainer, quite a different sort of a fellow, who always has a story and who is always in demand.

The lumber jack, like the dog with a bad name, is often a maligned individual, not being collectively any better or any worse than other men. It is said that nine out of ten lumber jacks are intemperate, and it is certain that the drink habit is the prevailing evil. The very strictness with which the liquor law is enforced during the long lumbering seasons seems to foster the desire; and in the spring, when released from the camp, the majority of the men never get beyond the Bowery district of their home town, always conveniently near to their landing place, until every cent of their hard-earned money is gone.

It is said that the moral status of lumber camps has improved in the past few years, owing to the distribution of good literature, missionary efforts, and the infusion of a number of better class laborers, notably Finlanders.

In every camp there is a "general store," where everything from a needle to a suit of clothes is kept, and an account run with every man. Each camp also has its own blacksmith and harness shops; in other words, each camp is a small settlement, complete within itself.

One thing done quite early in the season is the construction of an ice road by means of a large water cart. And this roadway aids greatly the hauling of logs.

The methods of handling and hauling the giant logs differ in different parts of the country. In the South, an axle with the large wheels and the chain are used, in other places oxen are used, in Minnesota and Michigan horses and sleds are used, and an ice road is made at the beginning of the season by means of a sprinkling cart, and in this way it is comparatively easy to draw a load quite a distance to the rollway.

In Oregon and Washington traction engines are used to haul the timber from the cutting points to the place of shipment.

On the Great Lakes the lumber boats are among the largest of the modern water craft.

It is quite a sight to see two medium-sized horses drawing an immense load of logs with so little apparent effort, this ease being entirely due to the ice roadway spoken of previously.

When the trees are felled and sawed into logs, they are skidded into piles by the side of the ice road. This "skidding" is done by means of a small sled, to one end of which the logs are fastened while the other drags upon the ground. Modern skidding is done by means of a skidding machine. Loading logs is an achievement of itself. It is done by means of horses, or by a machine. The banking ground, or rollway, is usually beside a river or stream of some kind, down which the logs are floated to a shipping point.

With the breaking up of the ice in the spring, these large piles of logs are rolled into the stream, to be brought to the mills. This is a most interesting and exciting time. The drivers, as they are called, the men who guide these immense lots of logs, are necessarily men of strength, quickness of perception, and nerve, for it is a very perilous occupation, and in which many lives have been lost. The most expert of these men ride upon the swiftly-moving logs, jumping from one to another when the case requires it, and being a second too late will cost them their lives. When, passing through some narrows, a log is caught, causing hundreds of others to pile up, raising the water and forming what is known as a jam, a driver has the opportunity to show his mettle, for this is the real danger. There are what are called "key logs" in this jam, that is, logs which, if released, will ease the congestion, and it is locating these and releasing them which becomes the driver's duty. Sometimes this is not easily done, and frequently a driver loses his life because he is not sufficiently agile to escape, once the fallen giants are released.

In many portions of the country rafts are used, as for instance in the South and on the Columbia River, rafts of from five to six million feet of logs are not uncommon. In the early days on the Great Lakes, rafts were brought down to the harbors of Lake Erie, where the sawmills were located. For the past number of years, however, the mills have been located at the shipping points, and the lumber is shipped on the boats. There are over three hundred lumber boats depending for cargoes on the lumber of northern Minnesota, Michigan, and Wisconsin, loading at Duluth, Superior, and other points.

Sometimes there is more than a million feet of lumber in one load, and it can be readily estimated what a statement of this kind would mean, when one realizes that there are some dozen or more lumber harbors on the American side of the Great Lakes. Chicago, Cleveland, Duluth, Erie, and Tonawanda are all large distributing points, and each has received more than five million feet of lumber during one shipping season. It would be interesting to figure the number of carloads this would make, estimating the carrying capacity of a car at forty thousand feet.

The German army authorities have just commenced, and will continue until January 15, 1908, an important series of experiments in wireless telegraphy at Metz and Strasburg, and at the six leading fortresses of Königsberg, Thorn, Danzig, Posen, Cologne, and Mainz. One thousand reservists, who have served as military telegraphists, have been called upon to work with those now serving with the army.

SCIENCE NOTES.

It is reported that McCullogh peak, the volcanic mountain which was described and pictured in the SCIENTIFIC AMERICAN of October 26 last, has practically vanished. Thrown up to a height of more than 3,000 feet by volcanic activity, it has now sunk until it barely rises above water. It is believed that the subsidence was a sudden one, due to an earthquake.

Archæologists have long believed that if Herculaneum could be uncovered, it would yield treasures more perfect and more valuable than those of Pompeii. But the cost of excavation, which would be much heavier than that of uncovering Pompeii, has always been a deterrent. Public interest in Europe has recently been directed to the suggestion, and as a result Signor Rava, the Minister of Public Instruction in Italy, upon whom the work actually depends, has prepared a bill providing for an appropriation of $100,000, for the purpose of removing the houses forming the modern town of Resina, which is located over Herculaneum, and an appropriation of $3,000 a year for actual excavation work. This at least insures Italy's practical interest, and brings the excavation appreciably nearer.

The famous "Giants' Causeway" in the north of Ireland is suffering the fate of the New Jersey palisades overlooking the Hudson, for it is in the hands of stone merchants. A consignment of 200 tons of the basaltic columns comprising the Causeway has recently been shipped to Philadelphia. It will be asked whether there is no power in Ireland to protect the Causeway. Although at one time it was supposed to be the work of the giants who abounded in Ireland, and to whom a piece of construction about a furlong in length would be child's play, it is not in a legal sense an ancient monument. The Irish courts decided that the stones belonged to a company, and since that time the causeway or pier cannot be seen without payment. It may therefore be assumed that the disposal of the basalt is a legal transaction. America is fast becoming a great museum, and it will be incomplete unless several of the natural as well as the artistic "curiosities" of Europe are to be found here.

M. Gustave Lippmann, the eminent scientist, recently made an experiment which gave some new results in connection with osmotic action. This relates to the endosmose of two liquids which have the same chemical composition but are used at different temperatures. It is already established that endosmose takes place between two liquids of different composition, such as pure water and a sugar solution. He wished to find whether there is any such action between two masses of the same liquid having different temperatures, and observed that such is the case. Two masses of pure water, one hot and the other cold, were separated by a porous membrane. There was found to be endosmose of the cold water toward the hot. As he could not use the ordinary kind of measuring instruments in this case, seeing that the action of heat would affect them, he devised a special instrument. The mass of liquid to be heated is contained in a narrow space between a porous disk about two inches in diameter and a brass disk lying opposite it. A thin rubber ring separates the disks, which are pressed together. A thin layer of the liquid is thus formed which is about one-fiftieth inch thick and has but a small volume. By means of a small brass tube the space is filled with hot water, and the tube is joined to a second horizontal tube of graduated glass. A cold water chamber is made in the same way, using the second face of the porous disk and a corresponding brass disk, filling the space with cold water by means of a second tube which is in permanent connection with a cold water tank. To give the difference of temperature between the two liquid layers separated by the porous disk we place the first brass disk upon a vessel of boiling water, so that it is in contact with the steam. At the same time the upper brass disk serves as the bottom of a vessel in which cold water circulates by a tube coming from the water pipes. In a few minutes there is established a constant difference of temperature. After waiting for half an hour we observe the osmotic action to be quite marked and regular, using gelatine as the membrane, the graduated glass tube filling up with water. The liquid column is increased at the rate of 0.6 inch per minute, and when the tube is full, the water comes out from the end. In a few hours the water which comes out has five or six times the volume of the hot chamber, and therefore the action is not due to heat expansion. Insoluble gelatine is found to be the best membrane for this purpose, but celluloid and other material can be used. Instead of measuring the volume of water we can also find the pressure or suction. The pressure is taken by placing the graduated tube in the vertical position. There is found to be pressure or suction according as the manometer gage is connected with the hot or the cold water chamber. Gases show a similar action, and the experiment can be made with hot and cold air and a paper membrane, and is easy to observe, as it is more rapid than with liquids.

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"KNOTS" IN THE RINGS OF SATURN.

BY DR. S. A. MITCHELL, COLUMBIA UNIVERSITY.

The director of the Lick Observatory has announced by telegraph that certain "knots" appear on Saturn's rings when they are viewed at the present time with the great 36-inch telescope. This discovery by Prof. Campbell has been confirmed by the keen-eyed Prof. Barnard from observations made with the 40-inch Yerkes lens, and also by Prof. Percival Lowell, director of the observatory at Flagstaff. In a letter to the writer, Prof. Barnard states that these condensations were first seen by him on July 2. They disappeared when the sun came into the plane of the rings; but reappeared on October 13. Since then they have been easily visible.

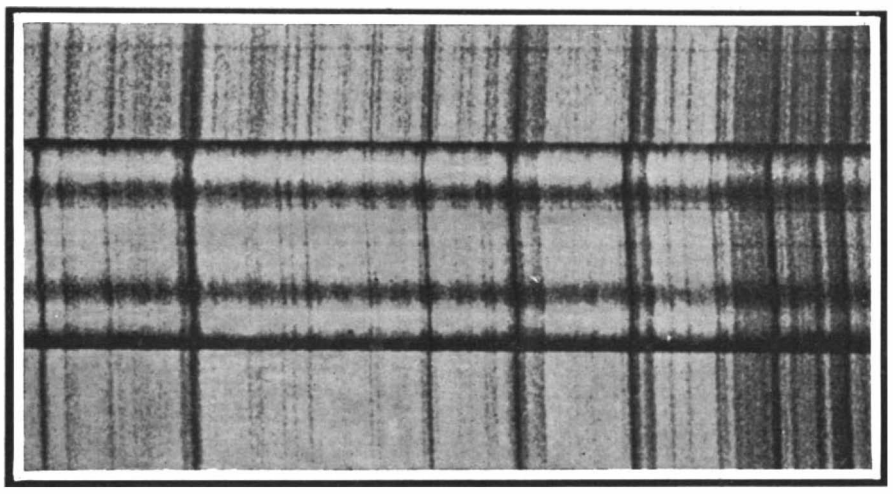
Percival Lowell, so well known from his observations on Mars, believes these knots to be due to a falling in of the rings on the planet itself, thus pointing the way to the ultimate destruction of one of the most beautiful objects of the starry heavens. Such an opinion, however, seems to be at variance with the ideas held by most of the rest of the astronomical world.

Early in October this year, Saturn presented the strange appearance of being entirely without rings, even when viewed in the most powerful of telescopes. No great catastrophe had happened on the distant planet, nor had "Saturn swallowed his children," as is told in the legend; but the disappearance was due to the simple fact that on October 4 the earth passed through the plane of the rings, giving us an opportunity of looking at them edgewise. If a small model were constructed of Saturn, on a scale of 10,000 miles to the inch, the planet itself would appear as a somewhat flattened ball 7½ inches in diameter, while on the same scale the rings would have a diameter of 17 inches, but they would be no greater in thickness than a sheet of paper. Nearly nine hundred million miles away from the sun, nine times farther off than the earth, it takes Saturn twenty-nine and a half years to make one revolution about the sun. Twice in this time, or every fifteen years, the earth passes through the plane of the rings, which though 170,000 miles in diameter, are probably not more than 100 miles thick. Compared with the eight hundred million of miles that we are distant from Saturn when nearest it, 100 miles is too small an edge (1/40 of a second of arc) to be seen even in a big telescope. Since those rings were first discovered in the tiny telescope used by Galileo nearly three hundred years ago, they have been a constant enigma to astronomers of all time, and it has been very difficult to explain how it is that this thin disk can hold itself together without breaking up while it rotates quickly about the planet.

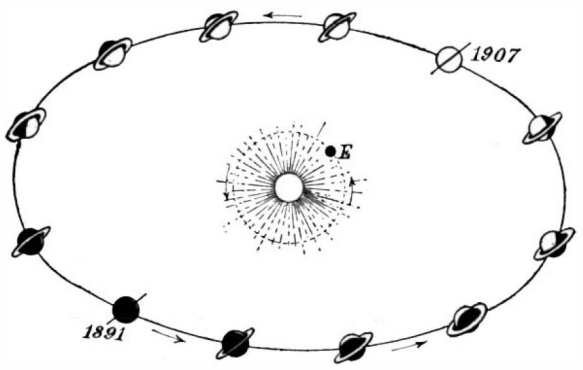
At the present time, a month after the earth has passed through the plane of the rings, they are seen not quite edgewise, and appear in a powerful telescope as a thin line of light. A splendid opportunity is thus afforded of discovering whether the rings are everywhere of the same thickness. As knots are seen along the thin thread of light, we must perforce conclude that the rings are not quite flat, but that they have condensations here and there, and that the particles that make them up crowd together more at some places than they do at others.

This is indeed no new discovery. Nearly half a century ago Otto Struve suspected that he saw bumps on the ring system, and the observations of 1907 are but a confirmation, using better telescopes, of what Struve saw. Moreover, Prof. Lowell's idea that the rings are falling in upon Saturn was proposed by Struve after a comparison of his drawings with still earlier ones. But the rings have now to our knowledge lasted three hundred years, and no real change in them has ever been noticed. The fear among astronomers and star gazers that this unique feature of the solar system may come to an end, appears to be well-nigh groundless.

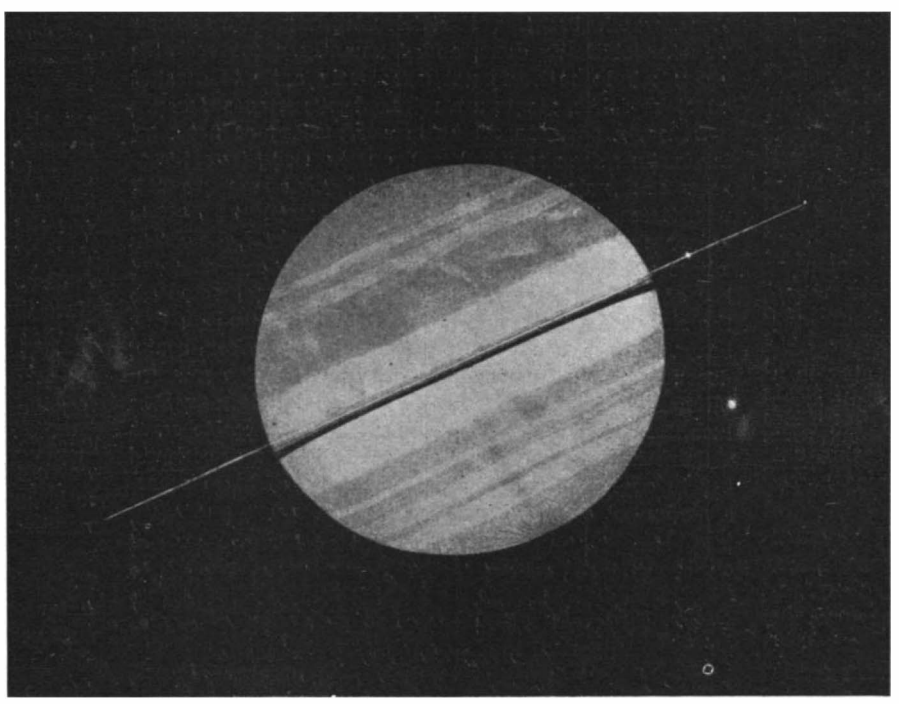
Sixty years ago the celebrated Clerk Maxwell showed that it was impossible for the rings to be a continuous solid and rotate about Saturn in obedience to the law of gravitation, but at the same time he pointed out that these rings must consist of thousands and millions of small satellites, each rotating independently about the planet, those nearest to it moving fastest. In 1895, a remarkable confirmation of this idea of Maxwell's was obtained from rather an unexpected quarter, viz., by means of the spectroscope. That the spectroscope, which tells us of the colors of the spectrum, and of the metals which constitute the far-off sun and stars, should tell us whether Saturn's rings are one body or many, seems a far cry; but such is the case. This it does by measuring the motion of the rings. If they are a continuous body, then the farther off from the planet, the faster they must move in miles per second; but if the rings are a collection of satellites, then those nearest the planet move the fastest, just as on a large scale Mercury, because nearer the sun, moves faster than Jupiter. The accompanying illustration gives a reproduction of one of the most marvelous photographs of modern astronomy, Keeler's spectrum of Saturn's rings, with the spectrum of the moon above and below for comparison. If the rings were solid throughout, each line of the spectrum of Saturn and its rings would form a continuous straight line inclined slightly to the vertical. Such is not the case, as is evident from a close inspection of the photographs. The change in direction of the spectrum lines proves clearly what Maxwell had shown from pure mathematics, that the rings are a system of small bodies, or meteorites, or satellites, each rotating independently about the planet. As a consequence of this mathematical theory, it can be shown that the satellites are liable to crowd together in certain places, even departing slightly from the average plane, but this does not point to the end of the ring system. It seems quite safe to predict that Saturn's rings will appear to our grandchildren just as beautiful as they do to us now.



THE SPECTROGRAPH WHICH CONFIRMED MAXWELL'S THEORY OF THE COMPOSITION OF SATURN'S RINGS.



PERSPECTIVE VIEW OF SATURN'S ORBIT, SHOWING WHY THE RINGS ARE NOW SEEN EDGEWISE.



SATURN AS HE NOW APPEARS. SPOTS ALONG THE THREAD OF LIGHT ARE MOONS IN FOREGROUND AND BACKGROUND.

The Overcoat.

The season of overcoats is approaching, says the London Lancet, and probably in no other department sartorial is there exhibited so much indifference to hygienic considerations. The greatest fallacy of all, perhaps, in regard to the choice of an overcoat is that the terms "weight" and "warmth" are synonymous. As a matter of fact they are nearly always diametrically opposed. Heavy materials are often good conductors of heat and are calculated therefore to allow the heat of the body to escape, while light materials are bad conductors and so preserve the heat and energies of the body. Moreover, the heavy overcoat is a tax on the resources of the organism and destroys the economy which a good insulating cloth is intended to secure. Further, heavy material encourages an uncleanly and unhealthy state of the body chiefly by imprisoning the exhalation of the skin. That cloth is best, therefore, which gives the minimum of weight and the maximum of warmth while being porous enough to admit of ventilation. It is not generally realized that in protecting the body from the dissipation of its own heat—i. e., from cold—clothing really serves as an economizer of fuel—that is, food. Could we accustom ourselves to wearing no clothing at all under cold climatic conditions we should have to consume much more food than we do in order to compensate for the rapid loss of heat which would happen if the body were not wrapped in non-conducting materials. This point needs to be borne in mind by those who advocate the banishment of the overcoat. It is, of course, possible to dispense with an overcoat, provided that the clothes worn are particularly warm. The overcoat, however, offers the decided advantage that it can be superimposed over a comparatively light suit of clothes and thus while preventing the escape of heat provides also an air space between the ordinary clothes and itself—an air space which is open to ventilation. There seems to be little doubt that a well-chosen overcoat surrounding a warm but light suit of clothes is for the reasons just given much more comfortable than a heavy suit of ordinary clothes. There is another important point about the qualities of an overcoat, and that is in regard to the color of the material. The choice of a somber hue—black, dark gray, dark brown, or dark blue—is totally opposed to scientific indications. The polar bear is not provided with black fur; if he were he would not be able to defy the cold with that impunity which he does. Light colored material, as a matter of fact, does not so easily give up its heat as does dark material, and this would appear to teach that our notions as to the suitability of color of garments for winter wear are illogical. Fashion and custom bind us hard and are seldom on all fours with reasonable ideas. If he would follow the dictates of science and common sense, the purchaser of winter clothing would choose, if he were able to do so, garments of a light rather than a dark hue. And why should everyone be clothed in a funereal type of material just when winter sets in, when every effort is necessary to compensate for the dreariness and darkness of its days?

New Fuel Made from Fruit Seeds.

A new kind of fuel will very soon be manufactured in Los Angeles, for which it is claimed that it will produce no odor, smoke, or gases and very little ashes from its consumption, that no kindling will be needed to set it on fire, and that two bricks will last practically all day in a stove or grate. It is composed of fruit pits from the canneries, mostly peach and apricot. About sixteen tons of these pits are to be used a day at the factory. The shells are broken up by a machine, and the inside pits, or kernels, are shipped to France, where they are used in the manufacture of prussic acid. These are mixed with other materials, including crude petroleum, or brea, a residuum deposit from the oil fields, planing mill shavings, and pulp from the olive oil mills. In connection with this fuel, "smudge" fuel will also be made for producing dense smoke. This will be used in orchards to preserve trees and fruit from frost, and has already been put to excellent service on a number of big ranches.

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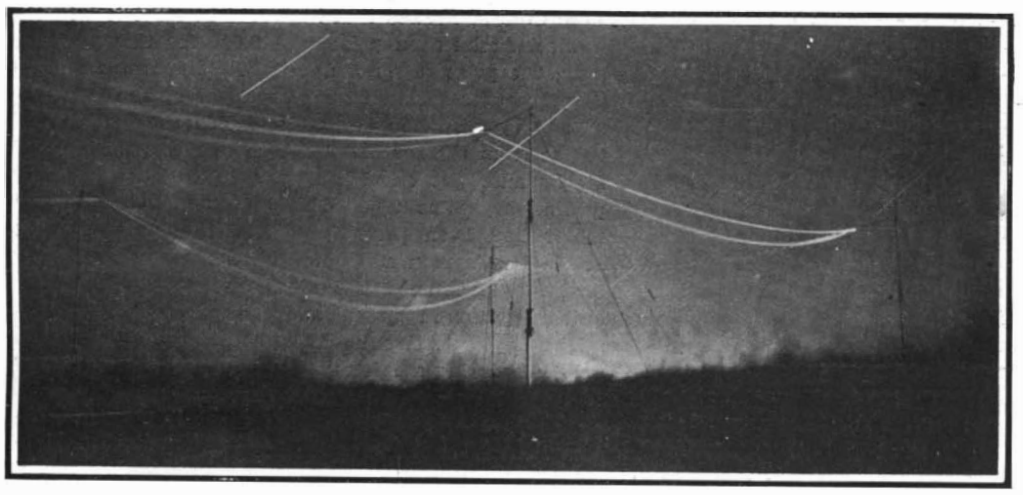
THE CLIFDEN STATION OF THE MARCONI WIRELESS TELEGRAPH SYSTEM.

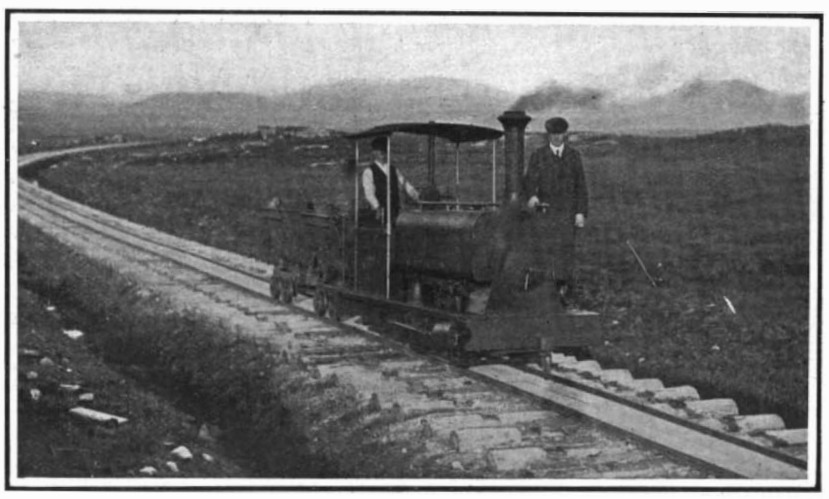
Situated on a barren and lonely headland of the coast of Galway, three miles from the town of Clifden, is the Irish station of the Marconi transatlantic wireless telegraph system. No less barren are the surroundings of the American station at Glace Bay, Nova Scotia. But in choosing a site for a station which is to violently set in motion the ether over a radius of 2,500 miles, no consideration can be had for the comforts or convenience of the surroundings. As a matter of fact, it is a decided advantage to place the station as far from town as possible, because buildings, trees, telegraph and telephone poles and wires, all tend to absorb a large part of the power radiated from the antenna. Clifden station's only communication with the outside world, other than that afforded by wireless telegraphy is carried on over an odd little narrow-gage railroad, which runs across the bog lands to the nearest roadway.

The site of the station consists of about 300 acres of bog land, on which have been erected the engineers' quarters, a power station, a large condenser house, and an elaborate antenna system. The arrangement of the antenna is very interesting. It is of the directional type recently invented by Signor Marconi. One of our illustrations shows the condenser building, with the antenna network to the rear. It will be seen that this comprises a number of tall masts, eight in number, which reach a height of 200 feet. Supported by these masts are fifty-two wires, which cover a horizontal rectangle about 200 feet wide and nearly 1,000 feet in length. At the forward end of this rectangle the wires are brought together in the form of a fan and carried down to a single cable, which enters the rear of the condenser house, as shown in another of the illustrations. It will be noted that the horizontal wires lead away from the vertical fan of wires inland, and not in the direction in which it is desired to send the messages. This has been found by experiment to cause the greatest radiation of Hertzian waves to take place in the opposite direction to that in which the horizontal wires run.

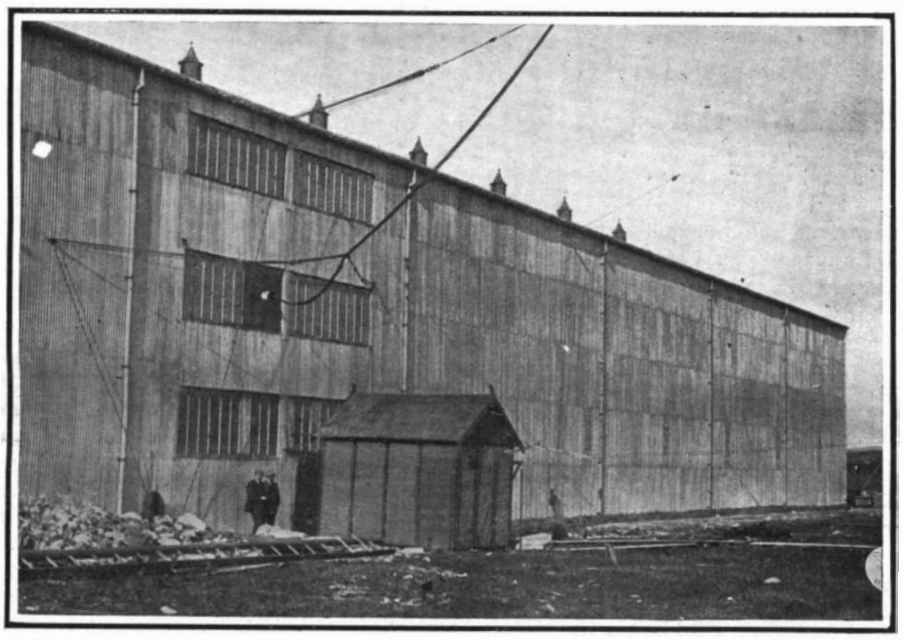
A very interesting photograph of the antenna network was taken at night, and this we reproduce herewith. It will be observed that certain of the wires are luminous, showing that there is a brush discharge from them, which affects the photographic plate. This discharge is invisible to the naked eye; but being largely composed of ultra-violet light, its presence is recorded by the camera. A person standing under the grid of wires while a message is being sent will hear a loud cracking noise, somewhat like that produced at the spark gap. Aside from the luminous wires, a number of parallel streaks of light are shown in the photograph. These, however, have nothing to do with wireless telegraphy, but are merely star tracks recorded on the plate during the half hour of exposure. It is quite a curious and interesting fact that only the outer wires of the antenna network are luminous, while at the end of the network the terminus of each of the fifty-two wires shows as a faint streak of light. This shows very clearly that the entire network acts as a single continuous sheet of metal; that the inductive effect of the wires within the rectangle serve to counteract each other and crowd the oscillating charge to the edges of the rectangle, just as would be the case if a solid plate were used; for it is well known that high-tension alternating currents seek the outer surface of an object or the edges of a plate. The photograph would then seem to indicate that the wires of the antenna are too closely arranged, and that a better effect would be produced by using fewer wires arranged at greater distances apart.



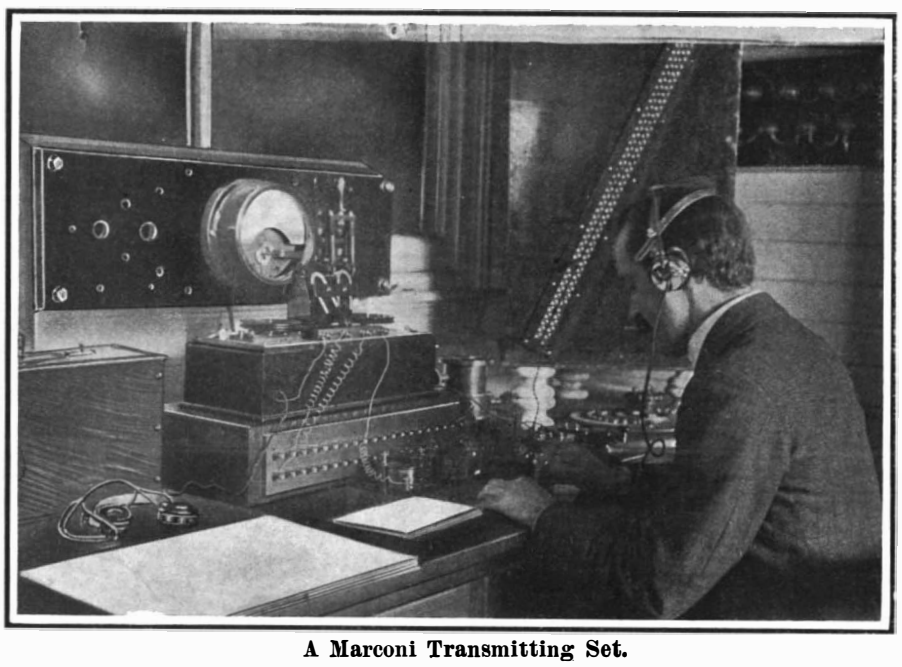
Night View Showing Brush Discharge from Antenna. Straight Lines Are Star Tracks.



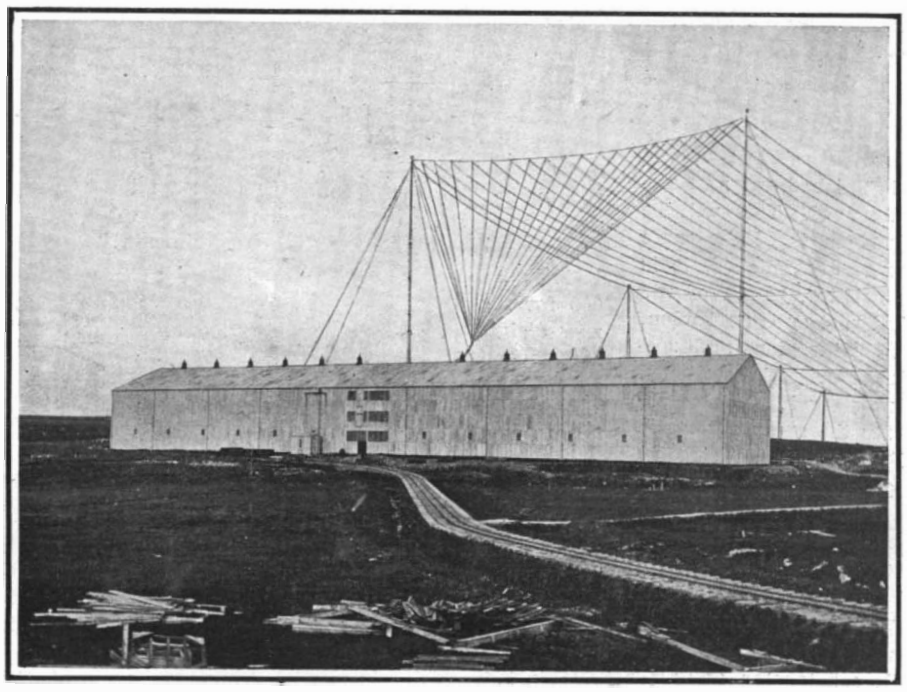
Railway Connecting Station with Nearest Roadway.



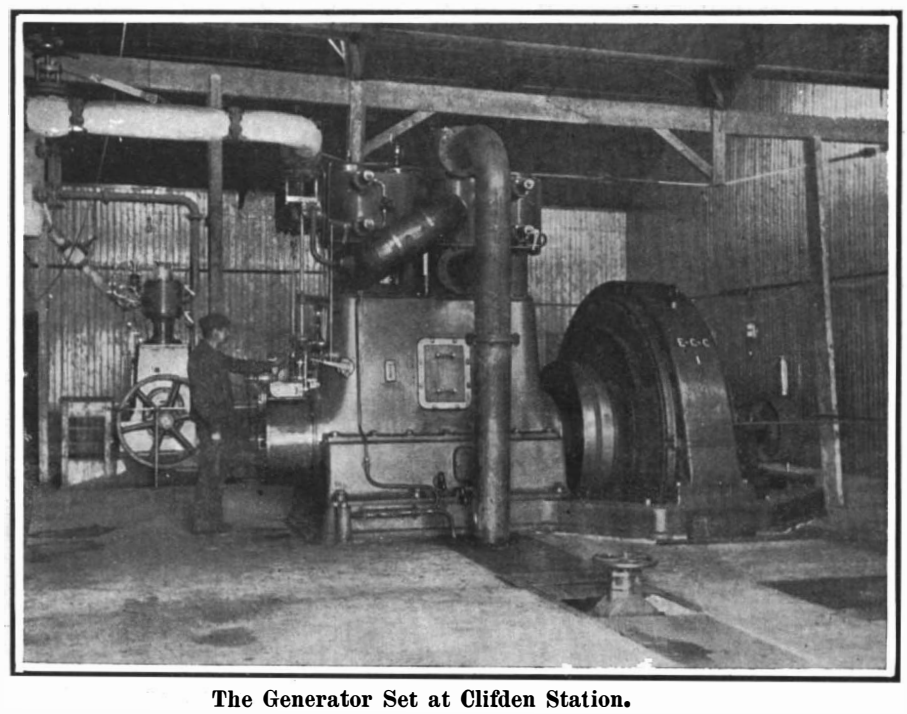
Antenna Cable Entering Condenser House.



A Marconi Transmitting Set.



Condenser House and Antenna Grid.



The Generator Set at Clifden Station.

THE CLIFDEN STATION OF THE MARCONI WIRELESS TELEGRAPH SYSTEM.

In Cornwall experience shows that woven-wire screens in the stamps which crush tin ores are better than punched plates.

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THE LARGEST SINGLE OFFICE BUILDING IN THE WORLD.

The erection of tall buildings has come to be of such frequent occurrence, that scarcely has one time to become thoroughly familiar with the skyline of lower New York, before it is changed by the building of a new skyscraper. Public interest is always centered in the tallest building on record; but the City Investment Company's huge building, which is now in course of construction, lays claim to distinction, not because it is of record height, but because it eclipses all others in the matter of cubic capacity and floor space. These figure up to 10,300,000 cubic feet and 500,000 square feet respectively. To be sure, the Hudson Terminal buildings will have a greater combined capacity; but as these twin structures are entirely separate from roof to street level, it is hardly fair to compare them with the City Investment Company's building. In the matter of height the latter surpasses every other structure in this city, with the exception of the tower of the Metropolitan Life Insurance building and the Singer tower. Measuring from the sidewalk level at the center of Cortlandt Street to the extreme top of the building, we have a height of 480 feet. The height above Broadway is slightly less, while that above Trinity Place is somewhat greater, owing to the difference in level of these two streets. The building occupies a frontage of 105½ feet on Trinity Place, and runs through to Broadway, where its frontage is but 37½ feet. A six story building at the corner of Broadway and Cortlandt Street cuts out 56½ feet of the Broadway frontage, and 106 feet on the Cortlandt Street side, leaving a Cortlandt Street frontage of 209 feet. The Broadway frontage adjoins the addition to the Singer building.

A feature of the City Investment Company's building, which above all others impresses itself upon the observer, is the fact that a deep recess or court is formed in the structure on the Cortlandt Street side. The building is thus divided into four distinct portions, which are respectively known as the Central Building, the West Pavilion, on Trinity Place and Cortlandt Street, the East Pavilion, and the Broadway Wing. The frontage on Cortlandt Street is unbroken up to the third story, but at this point the court begins, and extends to the top of the building. The central building rises above the rest of the structure, consisting of 33 stories, all told, while the two pavilions and the Broadway wing are but twenty-six stories high, or about 370 feet above street level. The object of having a light court on the street side of the building rather than on the inner side of the block is that it provides more light for the same area, and hence provides a larger number of light "outside" offices in the central part of the building.

The walls of the building are of Indiana limestone up to the sixth floor, and above this of special brick with terra-cotta trimming and copper cornices. A feature of the building is the arcade, which runs from Broadway clear through the building to Trinity Place. The arcade is formed with arched portals at each end, and occupies the entire width of the Broadway frontage. The height of the arcade is about 40 feet. It is finished in veined statuary marble with *breche violette* columns. The ceiling is barrel vaulted and domed and elaborately frescoed.

Twenty-three elevators will handle the transportation of passengers. Twenty-one of them are arranged in three banks which open on the arcade, and run up to the seventeenth, tenth, and twenty-sixth stories respectively. They are of the plunger type, and the excavations for the plungers of the elevators which will travel to the twenty-sixth story are probably the deepest bores ever made for this purpose. Above the twenty-sixth floor there are two electric elevators, which will carry passengers to the top or thirty-third floor level.

The foundation of the building is laid on concrete piers sunk to rock 80 feet below the street level. Unusually large foundation girders were required, one of which is a triple-web 90-ton girder 9 feet high, 37 feet long, and 5 feet wide. The basement and the sub-basement, which extends 30 feet below the curb level, will have an area of 32,000 feet. It is estimated that the building will weigh about 86,000 tons, and the steel structure about 12,000 tons. A 2,000 boiler horse-power steam plant will be installed in the building for lighting, heating, and power purposes. Besides the direct-heating system for the office rooms, an indirect heating system and fan ventilation will be installed for the basement and sub-basement. Water storage will be provided by two main tanks of 12,500 and 9,000 gallons capacity each. One of them will be located on the roof of the building, and the other half way down to the street level, so as to divide the head of water and reduce its pressure to a maximum of about 100 pounds per square inch. The usual stand pipes, hose, etc., are provided for use in case of fire, and these will be supplied from the upper tank.

The construction of the building is being rapidly carried on. At present writing the steel work has been completed up to the full height of the two pavilions and the Broadway extension, while the frame of the central building has been erected to the thirtieth floor. The building has been inclosed to the twenty-fourth floor at the front and to the twenty-seventh at the rear. We are indebted to Mr. Francis H. Kimball, the architect, for the details given above.

Aeronautical Notes.

Dr. Alexander Graham Bell has recently completed his first flying machine built of tetrahedral cells, and he expects to test the machine at his place at Baddeck, Nova Scotia, within a few days. Although having the tremendous projected surface of 2,200 square feet, this machine, with its 20-horse-power motor, will weigh but 290 pounds. In other words, the surfaces of Dr. Bell's machine will be loaded to about one-tenth of a pound to the square foot, which will make it amply able to carry a man at a very low rate of speed. In order to ascertain the actual horse-power required to fly the machine, it will first be towed with a tugboat. For this purpose a special float having a cradle that can be tipped in any desired position has been constructed.

A French inventor and mechanical engineer, Julien Arbin, of Meaux, has designed a flyer which he claims will be able to lift itself and travel at the rate of about 10 miles an hour. The framework of the apparatus measures 10 meters (33 feet) in length and the total width is 3 meters (9.9 feet). It will be fitted with ten horizontal propellers about 10 feet in diameter, which will be driven by a 100-horse-power gasoline motor. The total weight of the machine, including two aeronauts, one of whom is placed at the motor and the second at the rudder, is 1,200 kilogrammes (2,645 pounds). According to the present plans it will cost no less than $20,000 to build the new flyer.

M. Henri Deutsch has offered his airship "Ville de Paris" to the French government, and made a communication to the War Department to this effect. It is probable that the Minister of War will accept this offer, as the recent performance of the airship proves it to be of undoubted value. During the last six weeks this airship has been deflated while various changes and improvements have been made to its machinery. Chief of these is the fitting of a new propeller having a pitch of about 19.7 feet, and which the engine of the airship has turned at a maximum speed of 186 R. P. M. In a very successful trial on November 14, during which MM. Deutsch, Kapferer, and Paulmann were on board, the propeller turned at 140 R. P. M., and the airship traveled at a speed of about 26 miles an hour. A flight was made over Paris, the airship following the main boulevards and halting over the Place de l'Opera and the Place de la Madeleine. Finally the airship circled about the Eiffel Tower, where it encountered a wind of about 15 miles an hour. No difficulty was encountered in navigating against this wind. During the flight, the airship attained a maximum height of 1,050 feet, while the minimum height at which it flew was about 820 feet. The new propeller was found to work extremely well, and the airship was maneuvered without any difficulty. By the generous offer of M. Deutsch, France will now have another airship with which to experiment. On the other hand, as regards the airships of the Lebaudy type, M. Julliot states that as soon as the work of enlarging the "Patrie" is finished, the new airship "République" will be commenced. This will be followed by the "Démocratie," which is of the same general construction. After these are finished, it is intended to build three other airships. Each of the airships will be sent to a fortified post such as Toulon, Belfort, Lyons, etc., in the eastern region, and specially on the frontier. The "Patrie" is to be stationed at Verdun. The "Lebaudy" is now serving as a training balloon at Chalais-Meudon for the army aerostatic corps. On November 8 the "Patrie" made a circular flight around Paris, remaining in the air for four hours and covering a distance of about 85 miles. No attempt was made to drive the airship at high speed, as the aeronauts endeavored to keep in touch with some officers who followed the dirigible in an automobile.

The "Bayard" airship is a novel form which M. Clement, the well-known automobile constructor, of Paris, is now engaged in building according to the designs of the aeronaut Capazza. What is new about the form of the balloon is that the upper and lower halves are each conical, the bases of the two cones forming the horizontal median line of the gas bag. When once in the air, this balloon will travel forward and downward on its lower cone somewhat after the manner of an aeroplane. The design was drawn up some years ago by M. Capazza, but he could not have it carried out from lack of funds. An envelope of rubber-coated tissue is to be used, having the double cone form, with a width of 42 meters (138 feet) and a maximum height of 7 meters (23 feet). The total volume of the balloon is figured at 5,051 cubic meters (178,373 cubic feet). On the framework there are to be two propellers, each driven by a Bayard-Clement motor of the usual automobile type. It is designed to carry five aeronauts on board, together with over a ton of ballast, and to be able to remain for ten or twelve hours in the air. A well-developed system of planes will be added to the balloon. The profiles of the balloons are specially designed so as to transform the ascending or descending movements into a sliding movement or lateral displacement, and this gives the system an aeroplane action to some extent.

French Aeroplane Flights.

On Saturday, November 9, M. Henri Farman succeeded in flying a distance of nearly a kilometer in a circle above the parade ground at Issy les Molineaux, near Paris; but as notice had not been given to the Aero Club of France that he would attempt to win the Deutsch-Archdeacon prize of $10,000 for this performance, the prize was not awarded. M. Farman's flight was, however, timed by M. Archdeacon, and was witnessed by numerous spectators. There was a light breeze from the southwest when, shortly after 2 P. M., M. Farman got out his aeroplane, and made a few preliminary runs up and down the field. After the motor had been properly regulated, shortly after 3 P. M., M. Farman attempted the kilometer flight. At first the machine rolled along rather slowly, but it quickly gathered speed, and rose into the air at a slight angle. After he had reached the end of the field, the daring aviator turned his rudder slightly, and the machine made a graceful curve without any swaying or lack of stability. Once the turn had been accomplished, the machine headed straight for the starting point, where it landed after having made a flight of 999 meters (3,277½ feet) in 1 minute and 14 seconds—an average speed of about 30½ miles an hour. M. Farman afterward accomplished several other flights, in the last of which he made a huge S, and also demonstrated the facility with which he could make his machine rise or fall in response to the movement of the horizontal rudder.

On November 14, while making a flight in a semicircle, one of the blades of the propeller on M. Farman's machine snapped off. The engine was making 1,500 revolutions a minute, but fortunately the blade was thrown downward, and struck the ground with great force. Considerable trouble was experienced in getting the 8-cylinder V motor to operate properly on this day. Another aeroplane that was tried on this date was that of M. Pischoff. This machine did not leave the ground, trouble also being experienced with its motor. While the inventor was operating it, he attempted to make a sudden turn, and the machine tipped to one side and struck its wing against the ground, finally colliding with a fence and smashing the propeller and front part of the machine.

Experiments were also made recently with their machines by MM. Delagrange and Bleriot. The former's machine is very similar to that of M. Farman's, but unfortunately it was smashed in its recent first flight. M. Bleriot has built a new and larger Langley type aeroplane, fitted with a 50-horse-power, 8-cylinder motor. He too met with a mishap when he attempted recently to make his first flight with this new machine.

Airships for Our Government.

The announcement has just been made that Brigadier-General James Allen, Chief of the Signal Corps, will make use of the funds in the Signal Corps' annual appropriation for the purpose of constructing two small dirigible balloons for experimental purposes. It is hoped that later Congress will appropriate $200,000 for the construction of larger airships. The two new dirigibles will be probably of about 25,000 cubic feet capacity, fitted with 30 or 40 horse-power engines, and guaranteed to carry two persons with ballast and to remain in the air at least three hours.

All designers and builders of airships will be given a chance to submit their ideas to the Signal Corps, and the idea which seems to be best will be chosen. It is thought that the new dirigibles can be constructed for about $5,000 apiece. As soon as they are completed, the members of the Signal Corps will begin experiments without delay. Probably by next spring our government will have at least two of these machines.

The Forest Reserves have become popular in the West, as the reasons for them are better understood. The Montrose, Colo., Press thus sums up one aspect of the matter: "Stock is allowed on national forests to the limit of their capacity, but it is the policy of the Forest Service that persons living in or near the forests and owning small bunches of stock shall be first provided for. These are the home builders, the supporters of towns, schools, and churches. These are the ones first drowned out in an overcrowded range. What an invitation to be able to advertise to prospective settlers, that a place will be provided for them to range a small bunch of stock!"

The output of German coal for the first four months of 1907 was 46,087,753 metric tons—an increase of 1,528,039 tons; 18,285,781 tons of lignite, 6.428.148 tons of coke, and 4,686,618 tons of briquettes.

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Correspondence.

Longitudinal Sleepers.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to the remarks of T. C. L. regarding "Longitudinal Sleepers," I would state that we do not have to go to England for an example. I recollect the construction of what was known as the Ohio & Pennsylvania Railroad, in 1852, west from Pittsburg, Pa. The line is now known as the Pittsburg, Fort Wayne & Chicago Railroad. The men employed to grade and lay tracks, etc., were principally Irish, and the earth was moved by one-horse dump carts. The locomotives were designated not by numbers, but by names of the towns and cities through which the lines ran. I remember one of a pair of locomotives built from the same patterns—either the "Alliance" or "Allegheny"—which fell down an embankment just west of Rochester, Pa., and lay there a week or two till they could grade and track a way to haul it up to the main track. The locomotives burned wood, which was sawed by machines operated by one-horse tread power at stations along the line.

But about the track: After carefully grading the earth, there were laid two lines of timbers longitudinally, set apart the width of the track. Over these were laid laterally the ties, such as are now in use. My recollection is that the ties (then called "crossties") were laid loosely on the sleepers. To the ties the rails were spiked, their ends being joined by wrought-iron "chairs," notches in the rails and holes in the chairs being provided for the spikes which secured the joints, which were always placed on ties. I do not know when the sleepers were abandoned on that line, and the ties laid directly on the earth.

STANTON WEAVER.

Washington, D. C., November 1, 1907.

How Science Might Force a Spelling Reform.

To the Editor of the SCIENTIFIC AMERICAN:

In the main operating room of the Postal Telegraph Cable Company, in Chicago, one can see the electric typewriter "quad" between Chicago and New York, also the "octopus" between Chicago and St. Louis. These marvelous instruments both send and receive telegraphic messages moving over the wires in the Morse code. At the sending desk, say in New York, a young woman typist operates the keys of a specially constructed typewriter, while at the receiving end, in Chicago, the message is automatically transcribed in Roman type on the customary form ready for delivery.

The electric telegraphic typewriter is suggestive of great possibilities, and, in the mind of a layman, naturally raises the question: "What insurmountable obstacle prevents a similar attachment to the telephone?" Would it be any more astonishing than other recent discoveries in electricity? One must admit that the fundamental principles of the telegraph and telephone are widely different. At the same time, in a purely phonetic language like the Spanish, one has for each letter a fixed, standard unit of sound with which to deal. German, also, is relatively phonetic as compared to English. When we come to the latter, our mother tongue, however, we realize that such an instrument, if ever invented, could never transcribe into the word "knowledge" the sounds "n-o-l-e-j." Therefore, the Anglo-Saxon commercial world would at once demand a phonetic alphabet, if it should be thus offered by science. No business house could resist the temptation to purchase an "automatic stenographer," always ready and infallibly correct. E. F. MCPIKE.

Chicago, Ill., October 21, 1907.

The Aero Club Exhibit.

To the Editor of the SCIENTIFIC AMERICAN:

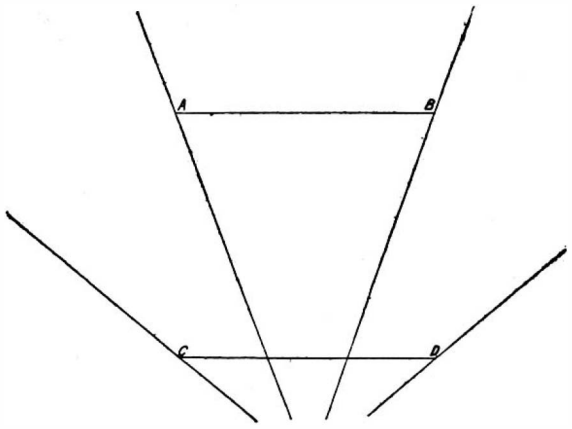
The aeronautical exhibit given in connection with the New York Automobile Show is well calculated to amuse the people more by its absurdity than impress them with the practicability of the machines exhibited; and indeed when one listens to the comments which it evokes and observes the jocular attitude with which most spectators approach this part of the inclosure, and the broad smile of easy good-natured tolerance with which they view the various devices purporting to sail on the air, it is evident that it fulfills the purpose of entertainer most admirably. To those not deeply interested, it must surely be a great relief to come here after being oppressed and confused with the massiveness and astonishingly intricate mechanism of the automobile, and relieve their tired brains by gazing on the curious display of crude, trivial, and inconsequent material with which it is proposed to compass flight. When we consider the costly machinery, material, and workmanship it requires to turn out an ordinary bicycle or motorcycle, to say nothing of the auto and motor boat, and on the other hand are obliged to witness the efforts of misguided inventors, with little or no exact knowledge in the premises, attempting to solve with a few bamboo sticks, some canvas, and an inadequate motor, that which in reality requires the most subtle and elaborate calculations to determine the most efficient type, and the finest and most costly material in its construction, the sublime folly of the thing is at once apparent. I would like to speak at greater length, but I do not wish to encroach unnecessarily on valuable space. Of what use is it to point out the obvious deficiencies that exist when the deductions, experiments, and conclusions of able investigators better qualified to teach this science pass unheeded? I will make but one suggestion: when an inventor conceives an idea, let him look up such authorities as O. Chanute's "Progress in Flying," or "Conference on Aerial Navigation"; he will probably learn of some similar machine that has been tried and found wanting; and unless he is desirous of gaining sudden glory and possible gain as the inventor of a flying machine that signally fails to exhibit that desirable quality, he will sheer off on another tack. I would particularly recommend a careful reading of the essay in the latter work, "On the Problem of Aerial Navigation," by the late C. W. Hastings, a promising young civil engineer, whose untimely death must ever remain a source of regret to all who are interested in the advancement of the science. J. C. PRESS.

South Norwalk, Conn.

An Optical Illusion Produced by an Ingenious Arrangement of Straight Lines.

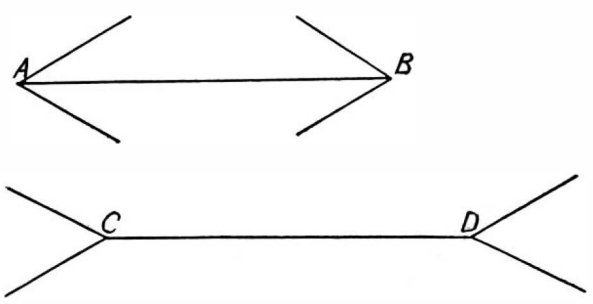
To the Editor of the SCIENTIFIC AMERICAN:

Herewith I send what I believe to be an optical illusion. I have never seen the same before, having



come upon it by accident, but have never yet found any one who did not pronounce line *C D* longer than line *A B*. If this is of any use to you, you are welcome to it. G. W. HINMAN.

[We call attention to the optical illusion illustrated below in which both lines are of the same length, although *A B* seems to be much the shorter. The principle is obviously the same as that to which our



correspondent calls attention. Both illusions depend for their efficacy on the fact that divergent lines give the appearance of length to a straight line with which they are associated.—ED.]

The Sterilizing Effect of Saliva.

To the Editor of the SCIENTIFIC AMERICAN:

Nowadays in deference to public opinion we dentists are all sterilizing our dental instruments, whereas formerly we simply gave them such cleansing as common decency properly demanded, and very properly, too. But now it is contended that dental instruments are dangerously infected by the secretions of the mouth, if not by what is popularly called "decay" in cavities which need filling.

If this theory is true, why are not people fatally poisoned by the use of teaspoons, forks, cups, and glasses out of which they drink? Why is not the food we eat from plates also poisoned by contact with plates and cups previously used by others and only washed supposedly with soap and hot water, wiped on unsterilized dish towels, and then handled by the unsterilized hands of the cooks and waitresses just before we use them? We use all of these unsterilized articles a hundred times, perhaps a thousand times, where a dental instrument enters the mouth once.

Why is not the ragamuffin dead in ten minutes after eating parts of a rotten apple or orange which he picked up from the street?

Is it not because the fluids and mucous secretions of the mouth, as well as of the nostrils, are far more efficient sterilizers than any man can invent—an instantaneous sterilizer without being itself dangerous to us to touch or swallow, like the sterilizers we are now using in our practice?

We all know the inner cavities of the body cannot be opened to the air, even, much less safely be operated upon with surgical instruments or touched with unsterilized fingers, without great risk of death to the patient, and the success of modern surgery therefore is most marked. But I have practised dentistry for more than fifty years and I never knew or read of a patient being poisoned by ordinary dental operations, and I have personally known more than one dentist going from one patient to another without even washing his hands or giving any attention to cleaning his instruments. Of course such negligence is shocking and contemptible.

In the winter and spring of 1900-1 I collected about a pint and a half of pure saliva by means of a drainage pipe used in filling operations, and saved it for an experiment, which consisted of exposure to the air during the hottest summer New York has experienced that I know of, viz., 1901. In September that fluid was perfectly limpid and absolutely free from odor or other evidence of decomposition, as Dr. Bellamy of Bellevue Hospital can testify. Is there any other portion of the human body, except perhaps the hair, nails, and bones, which could have stood that test, and does it not prove that those fluids are themselves wonderful sterilizers before which bichloride of mercury and sublamine are nowhere? Meanwhile those people who intrust the sterilization of their eating utensils to their cooks and butlers need not fear that their dentists do not sterilize their instruments, for we all do it.

October 23, 1907. CHARLES A. NASH.

The Current Supplement.

The current SUPPLEMENT, No. 1664, contains an unusual number of interesting technological articles. The process known as case-hardening is described most thoroughly by George Shaw Scott, a recognized English authority. Octave Chanute presents an excellent consideration of the steaming of timber. The fifth installment of Prof. Watson's "Elements of Electrical Engineering" is published. The installment deals with constant-potential generators. L. H. Flanders traces the trend of storage battery development. Mme. Curie discusses the atomic weight of radium. W. G. Clark writes on helion filaments. The recent work of Prof. Delage in producing what passes for artificial life has attracted some attention in the newspapers. For that reason our Paris correspondent's summary of what he has accomplished is timely. The interest of the scientific world was recently aroused by the story of Prof. Metschnikoff's experiments upon fermented lactic bodies, which were found to have a highly beneficial action upon the organism. He claims that their use will tend to restore health generally, and even to lengthen life. Hitherto it has been almost impossible to procure these products on a practical scale. How this is done, and what the substances really are, constitute the subject of an article entitled "Kefir and Yohourth." Prof. H. Molisch has recently published the results of several years' study of purple bacteria. A few of his interesting discoveries are briefly described. The "Development of Armored War Vessels," which is the title of J. H. Morrison's review of the rise of the United States navy, passes to a thirteenth installment, in which the more recent battleships and cruisers are described and illustrated. In an article entitled "Astronomy on Mont Blanc" the work of Prof. Janssen is described.

The Alcohol Congress.

A congress of industrial alcohol has been organized by the commission of the Paris Automobile Show this year, and it will be held during the period of the exposition, which lasts from Nov. 12 to Dec. 1, under the auspices of the Automobile Club of France. The work of the congress is divided into a number of technical and economic sections, which will bring out the most recent information in the field of industrial applications, such as to motors for automobiles, stationary engines, lighting and heating, etc. The first section of the technical category is devoted to applications of alcohol to automobiles. Second section, to industrial, agricultural, and commercial applications outside of automobiles. Third section, to lighting and heating. Fourth section, to manufacture, denaturing, and carbureting of alcohol. In the category of economic sections of the congress are first, production and consumption; second, applications, depots, instruction of the public; third, legislation, customs duties, statistics; fourth, use of denatured alcohol in the war and navy departments. The latter section is specially concerned with the question of automobiles and hauling cars for army transport. The two groups of sections will hold separate meetings to discuss these questions. Besides this, it has been decided to hold a full meeting of all the sections in order to consider the fiscal questions relating to denatured alcohol.

By rubbing metals with salt, before applying mercury, the ancients obtained a reaction similar to that for which copper sulphate is used. The chlorine released from the salt formed a silver chloride easily attacked by the mercury, so as to form an amalgam.

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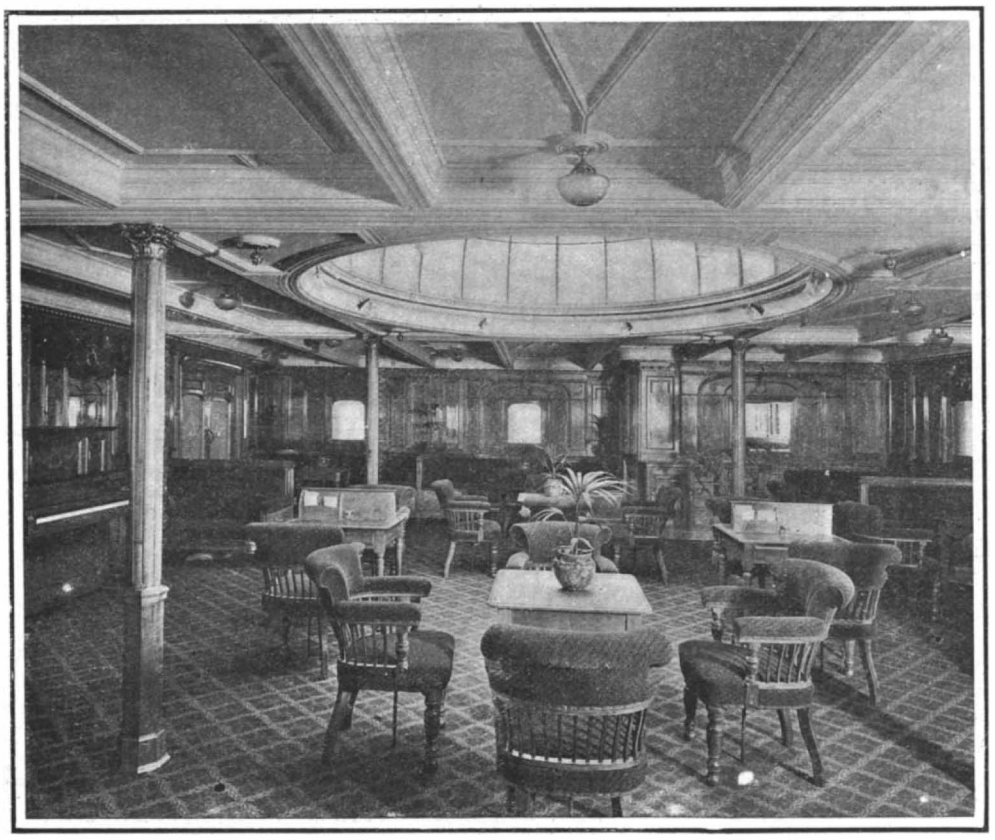
THE QUADRUPLE TURBINE STEAMSHIP "MAURETANIA."

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

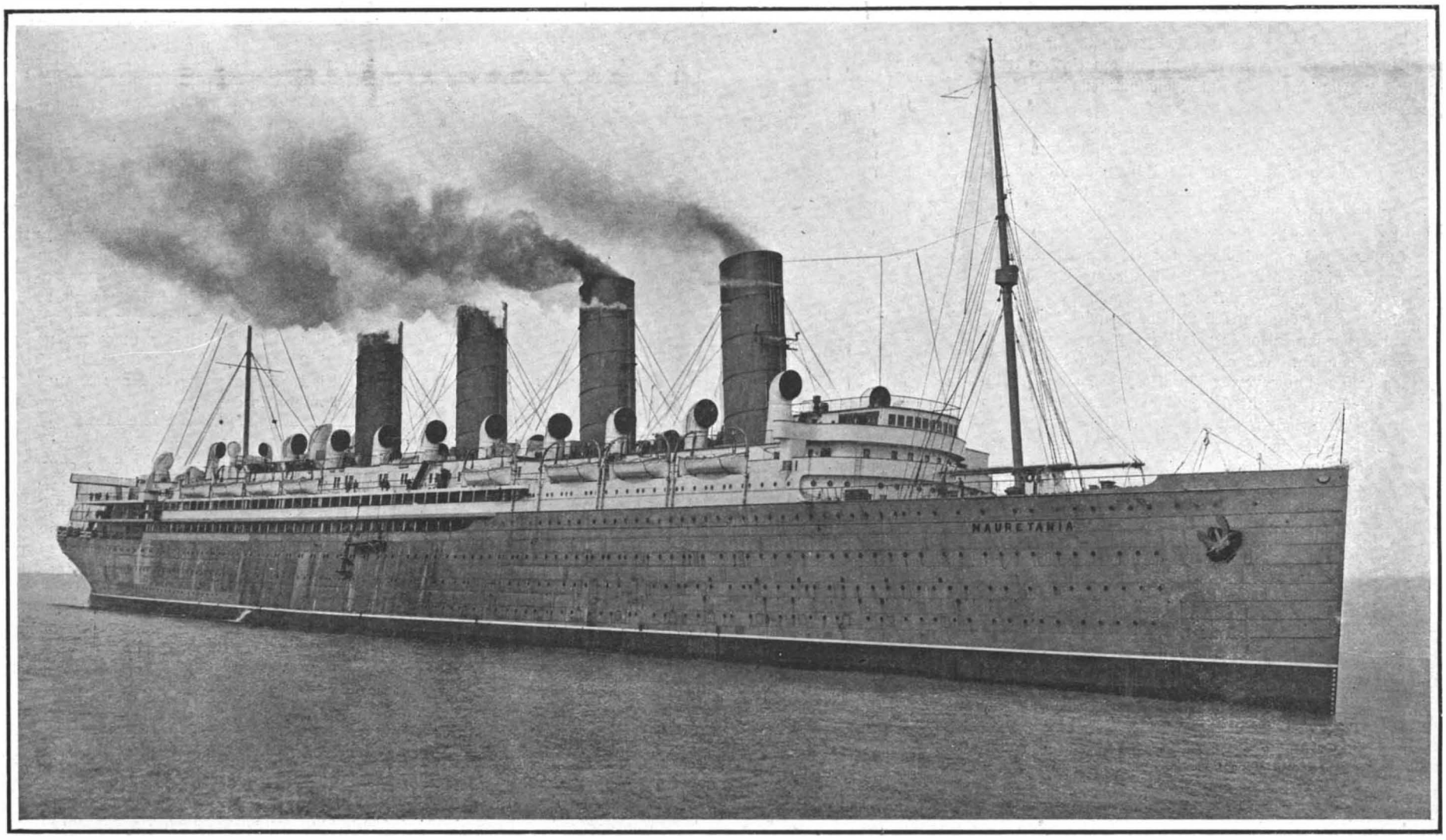
The recent achievements of the steamship "Lusitania" have stimulated increased interest concerning her sister vessel "Mauretania," which will, it is anticipated, accomplish even better performances. Although almost identical in design, the results that were obtained by her designers and builders, Swan, Hunter & Wigham Richardson, of Wallsend-on-Tyne, in the builders' trials gave every indication of the "Lusitania's" high speed being exceeded. The later Cunarder is, however, larger than her sister ship, the advantage of this development being an appreciable reduction of her weight combined with an increase in her capacity. The cellular double-bottom principle of construction has been adopted with floors on every frame, and this double bottom is continued well up the vessel's sides.

A powerful commission of engineers was appointed to determine the dimensions and propelling machinery necessary to fulfill the Admiralty's requisitions for a "speed of 24½ knots in moderate weather," together with the large passenger-carrying capacity that was aimed at, and numerous experiments were carried out at the government testing tank at Haslar by Mr. R. E. Froude. In addition other models were prepared and tested under the direction of Sir Philip Watts, the present Director of Naval Construction to the British Admiralty. At the conclusion of these investigations the builders, upon their own initiative, constructed a model 47½ feet in length. This was propelled by electrically-driven mechanism, and a series of experiments were carried out to arrive at the most suitable form for the after lines of the ship, the number of the propellers, and their relative positions so as to achieve the most satisfactory results. These experiments, which were of the most elaborate description that have ever been carried out, were continued incessantly over a period of nine months, and the data thus gained have proved of supreme value to the builders. These investigations were carried out by Mr. G. B. Hunter, D.Sc., who was ably assisted by Sir William White, the late Director of Naval Construction, in his capacity of consulting naval architect to the Tyneside builders, throughout the whole time occupied in ner construction. The sum of these joint efforts has been the production of a graceful vessel having very fine lines, and one which at full speed throws a very small bow and stern wave. The machinery is



The Second-Class Lounge.

The First-Class Smoking Saloon.



Length, 790 Feet; Beam, 88 Feet; Depth, 60 Feet; Gross Tonnage, 33,000; Draft, 37 Feet 6 Inches; Displacement, 46,640 Tons.

THE TURBINE LINER "MAURETANIA."

difference in tonnage being about 300 tons, due to an increase of 5 feet in her length and some 5 inches in her molded depth. The leading dimensions are as follows: Length over all, 790 feet; length between perpendiculars, 760 feet; breadth, extreme, 88 feet; depth, molded, 60 feet 6 inches; gross tonnage, 33,000 tons; draft, maximum, 37 feet 6 inches; registered displacement, 46,640 tons.

An important feature of her construction is the large proportion of high tensile steel that has been worked into her hull and upper works, a distinct similar to that installed in the "Lusitania," of which we recently gave particulars, and therefore omit them here.

In regard to the appointment of the passenger accommodation, the "Mauretania" excels her sister ship in luxury. The first-class accommodation for 560 passengers extends over the five uppermost decks, access between which is gained by means of the electric lifts, the incorporation of which was first suggested by the SCIENTIFIC AMERICAN, operating in the well of the grand staircase. This staircase is carried out in the

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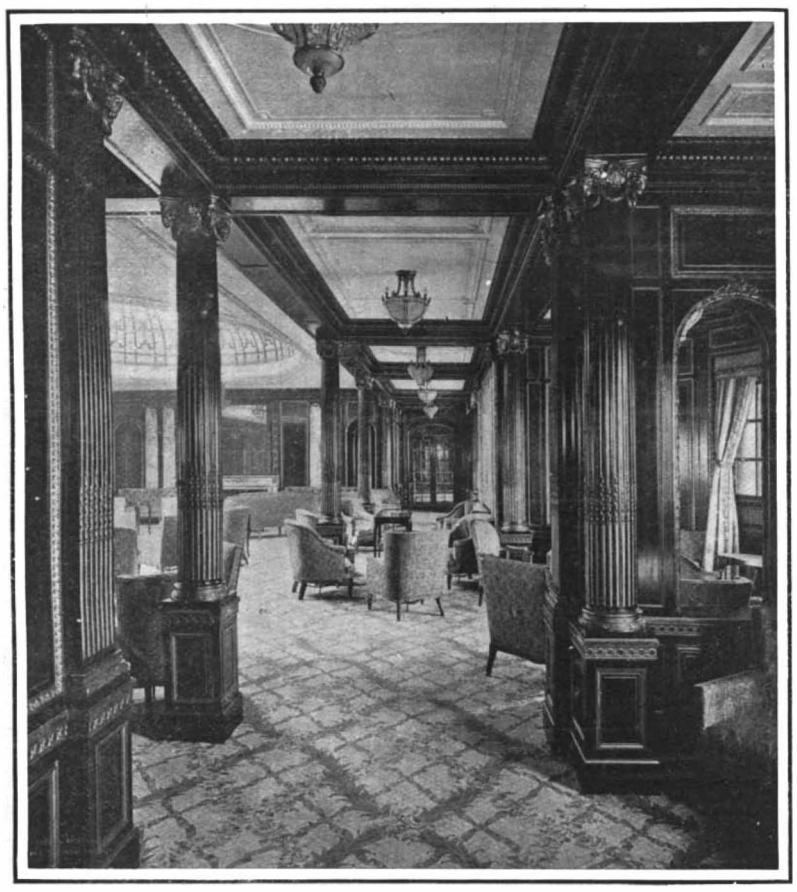
style of the sixteenth century Italian, the whole of the woodwork being in French walnut, with the panels veneered with the finest figured wood. The paneling is relieved by carved capitals and pilasters, in which repetition of design has been avoided, and the prevailing impression is one of soft and heavy richness, relieved by the pleasing silvery tone of the aluminium "grille" or railing around the elevators.

The dining saloons, of which there are two, are decorated in oak in the style known as Francois Premier, the type most closely followed being that prevailing between the years 1540 and 1550. The woodwork is richly carved, the panels being disposed so that no piece of carving resembles its neighbor. By this means a pleasing variety has been produced, some of the carving being of an exquisite nature, especially the arched bulkheads running at right angles to the sides of the ship. The upper saloon terminates with a lofty groined dome, and the crown of the dome terminates in a gilded convex disk, round which runs a balustrade sheltering hidden electric lights, whose illumination striking the disk is projected in a soft bright radiance into the saloons below. The lounge is carried out in the late eighteenth century French style. The room is attractively broken up by symmetrical semicircular bays flanked by fluted columns, which with the panelings are of mahogany, cross veneered to give the best effect to the figuring. A dull polish of golden brown is imparted to the wood surface, blending harmoniously with the rich gilt of the carvings and moldings. The furniture is executed in beech and upholstered with various colored brocades, which are all reproductions of the Louis Seize period; and to afford a pleasing and striking contrast to the sense of lavish ornament, the numerous tables are made quite plain, though polished and of varying shapes and colors.

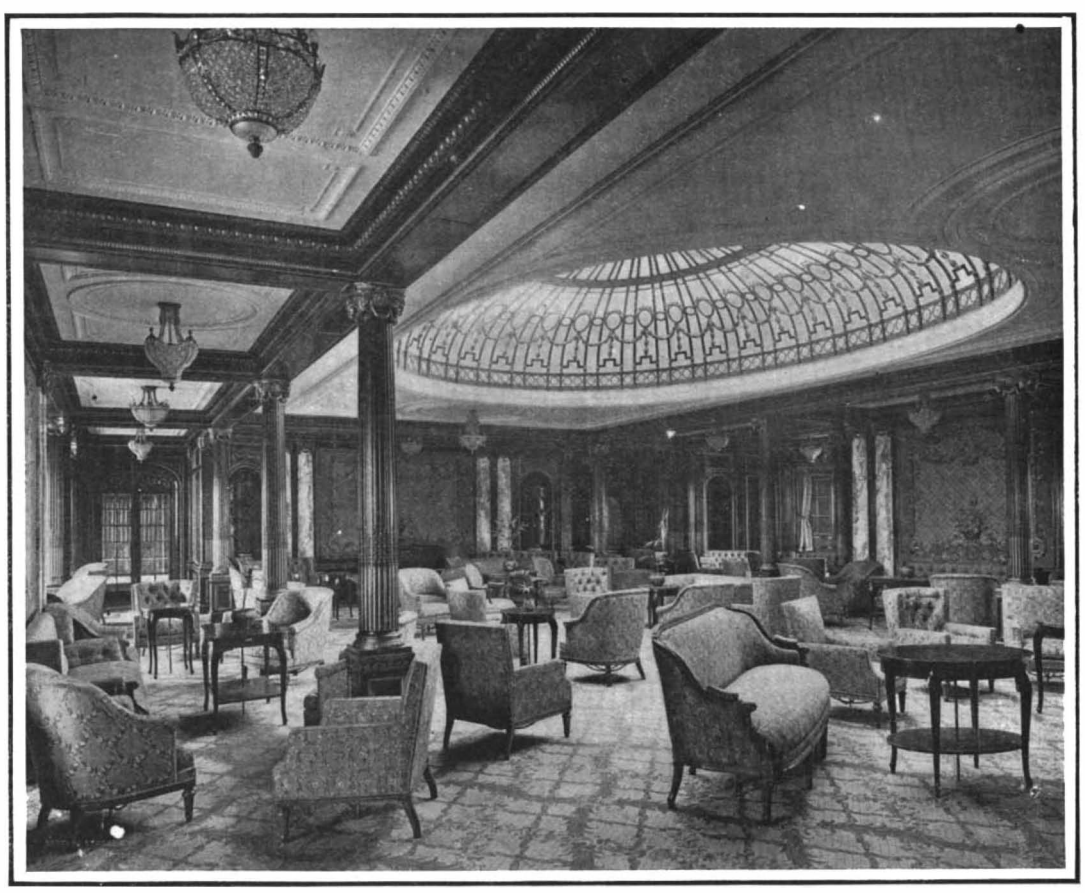
The library wall paneling is in sycamore of exquisite grain, stained silver gray, the carved moldings being gilt, and the extensive bookcase being made to constitute one wall of the apartment. The floor is covered by a deep rose-colored carpet with a brocade border, which scheme also dominates the seats. The frames of the chairs and the tables are carried out in mahogany, and are copied exactly from the antique furniture of eighteenth century France. An excellent relief to the softness is afforded by the massive fireplace, the chimney piece of which is of white statuary marble surmounted by a mirror, while the small-paned clear beveled glass doors afford an excellent view of the corridors in either direction for 350 feet.

In the first-class smoking saloon the most interesting feature is the lounge extending the full length of the apartment, divided into recesses with divans and card tables. On all sides the room is broken up into enticing nooks and cozy corners, while the windows, which are of large size, are unique in ship decoration, being treated with semicircular arches, imparting the appearance of a medieval country house. Possibly, however, the most striking feature is the fireplace, which is of the old-fashioned open type, of massive proportions, and surmounted with a somber carved wood hood.

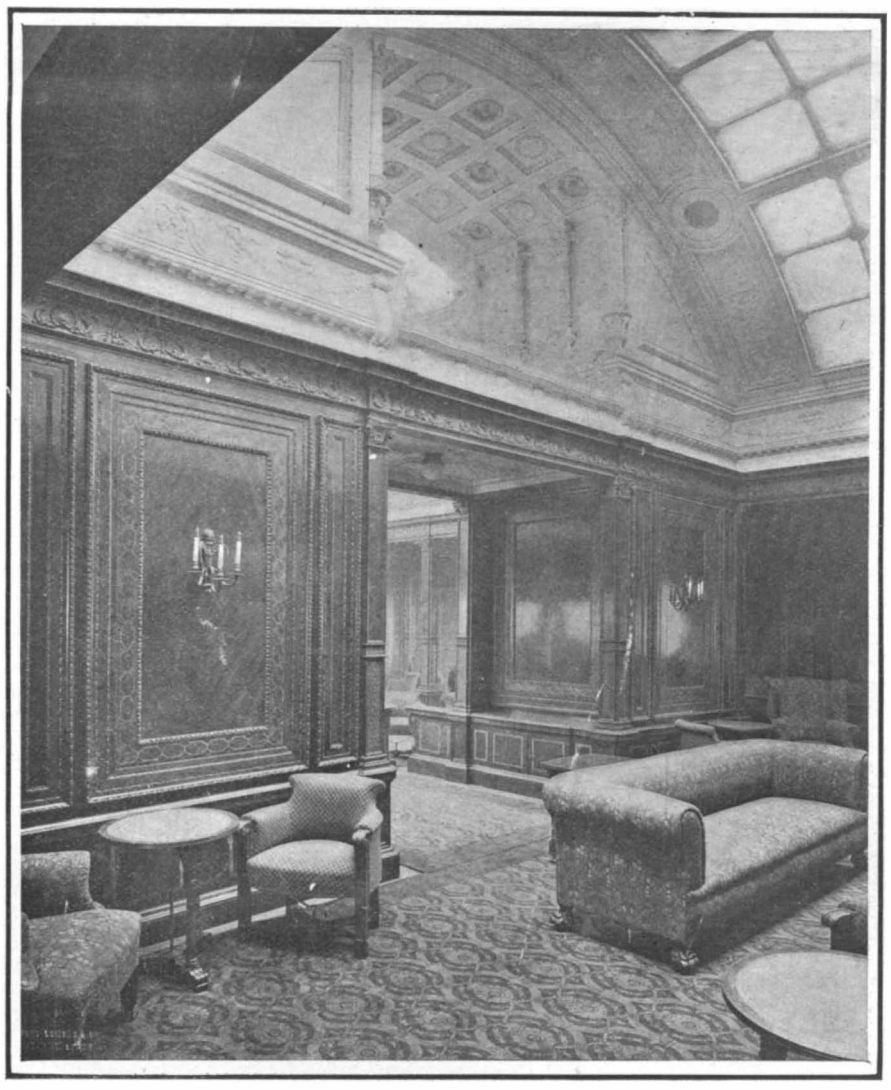
Endless variety is the keynote in the decoration of the 253 first-class staterooms, arranged to accommodate from one to three passengers according to position of the cabin. For the most part the wall paneling is



The Corridor of the First-Class Lounge.



The Lounge Looking Aft.



Corner of the First-Class Smoking Saloon, Showing Inlaid Walnut Paneling.

The Dining Room, Executed in the Style of Francis I.

THE TURBINE LINER "MAURETANIA."

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carried out in white, relieved with variously colored woods for the furniture, such as satinwood, oak, mahogany, and walnut. The same scheme of comfort is continued in the second-class quarters, where there is accommodation for 375 passengers. In the fore part of the vessel, distributed over four decks, is the third-class accommodation. The dining saloon, which is the principal apartment, is 84 feet in length, extending the full width of the ship by 10 feet in height. It marks a decided advance in the provision of comfort and elegance for this class of passengers, 1,300 of whom can be carried, for the walls are paneled out in polished ash with teak moldings. Three hundred and thirty persons can be accommodated at one sitting.

Careful attention has been devoted to the problem of thoroughly ventilating the whole of the vessel, it being so designed as to enable a change of air throughout the whole ship at intervals of ten minutes. The flow of air into each cabin may be controlled according to the desire of the passenger; and while in summer the inflow may be cooled, in winter it is warmed before admission.

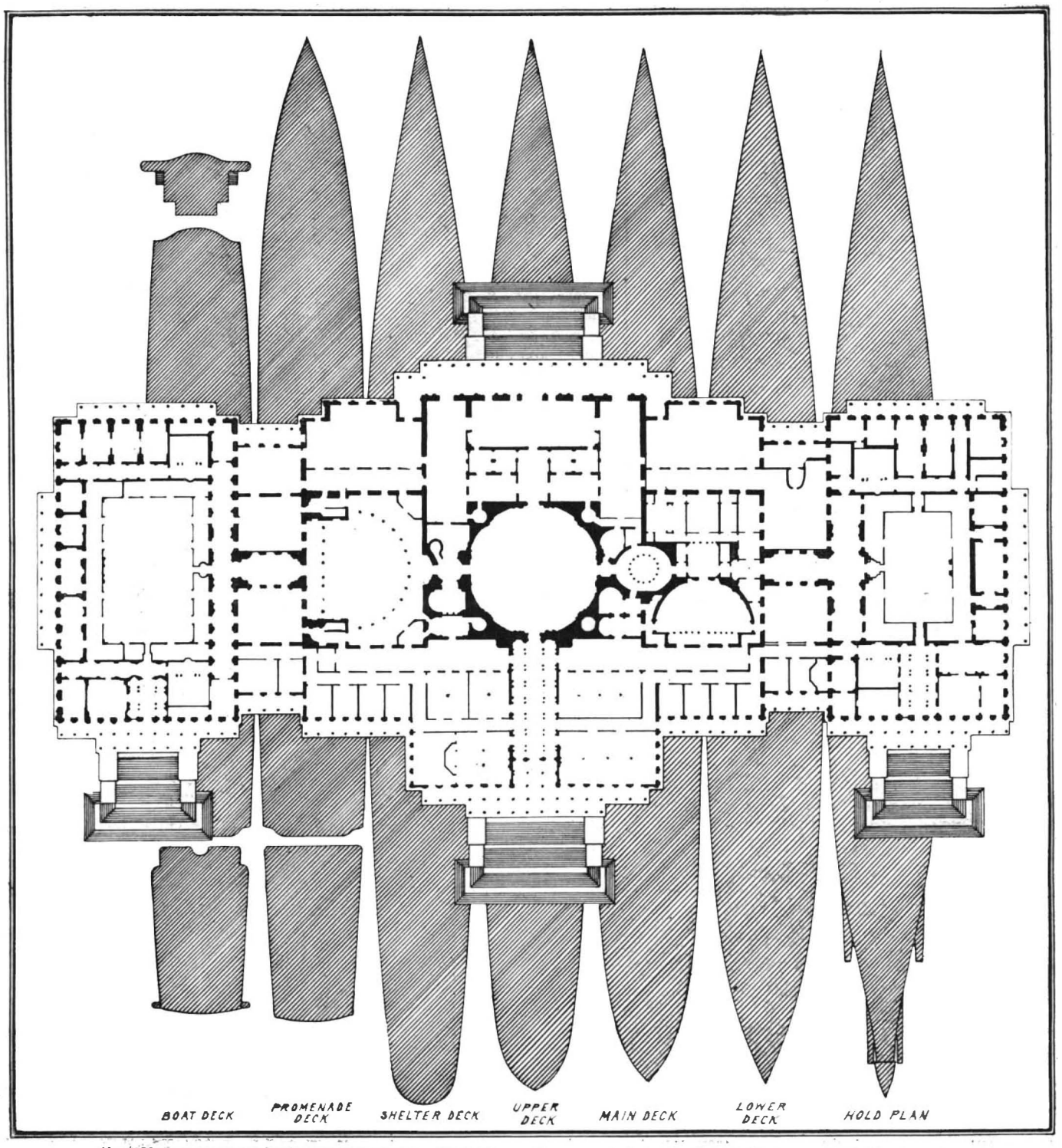
After the adjustment of compasses in the North Sea and a few preliminary builders' speed trials over a measured mile, the "Mauretania" traveled 1,000 miles round the north of Scotland to Liverpool for dry-docking prior to her official speed trials. In the 1,200-mile test run her average speed was 26.3 knots; over a 300-mile course she averaged 27.36 knots, or about 31½ land miles an hour—nearly a knot faster than the time made by the "Lusitania."

Special attention has been devoted to the adequate ventilation of the engine room and stokeholds. It is stated in some quarters that with turbine machinery the engine room becomes insufferably hot; but according to the experience of the engineers upon the builders' speed trials, while the temperature is at times inconvenient, it is not intolerable. In the case of the quadruple-expansion reciprocating engine, the high-pressure cylinders, where the greatest heat prevails, are elevated to a point well up in the engine-room space, and the hot air around the former in ascending induces a correspondingly stronger inflow of cool fresh air below.

In the case of the turbine, owing to the high-pressure steam pipes being practically upon the floor of the ship, no such advantage as the above can be gained; but the temperature conditions can be appreciably ameliorated by an elaborate ventilating system, such as has been installed. In the stokeholds, on the other hand, according to the evidence of the stokers, the heat is considerably below that generally prevailing upon an ordinary liner with cylindrical engines, and even when the steam is at the maximum supply and the highest pressure, the variation in temperature is never more than one or two degrees.

For the construction of the "Mauretania" some 6,000 working drawings were made, of which more than half concerned the ship and the rest the engine equipment. During the building of the ship, 5,000 employees were pressed into service, which number at times was augmented to 8,000 persons. For the electric lighting of the ship there are over 200 miles of cable, and the electric generating station is larger than that laid down for a good-sized town. In regard to her coal consumption, it is computed that for a round trip between Liverpool and New York some twenty trains each hauling over 500 tons of coal would be required; while to deal with this coal on board, 350 trimmers and firemen are required out of a total crew of 800 men.

Considering the enormous cost of a ship of these dimensions and speed, the doubt has been expressed as to whether its operation will ever become a financial success. Upon this point the owners have not the slightest apprehensions. The value of the passage money that has represented the trips of the "Lusitania" up to the present time has fluctuated between $175,000 and $200,000 per passage; and in view of the fact that the winter season is the slackest in the steamship traffic between America and Europe, the outlook for the busy summer season is decidedly auspicious, and the ships have the promise of a very considerable government subsidy.



The "Mauretania" is 790 feet long by 88 feet broad. The total area of her seven decks is more than double the area covered by the capitol.

DECK SPACE OF THE 'MAURETANIA" COMPARED WITH THE FLOOR PLAN OF THE CAPITOL AT WASHINGTON.

Alloys of Aluminium and Magnesium.

As magnesium is very much lighter than aluminium, and can be had at a reasonable price, there has been considerable employment of alloys of these two metals.

It is well known that pure aluminium is too soft for sand castings. To harden it, it must be alloyed with another metal. For this purpose, zinc has been preferred; but in order to get the desired strength and hardness, an undesirably large proportion of the alloying metal is necessary. Copper also is employed for this purpose, less of this being needed than of zinc. As, however, both these metals are much heavier than aluminium, the alloys which they form therewith are also heavier. There are many cases, says a writer in the Deutsche Metall-Industrie Zeitung, where there is desired a light aluminium alloy which shall also be tough and hard, and can be used where otherwise brass would be employed.

As an addition to aluminium, magnesium has properties possessed by no other metal. Its specific gravity is only 1.75, against 2.58 for aluminium. It hardens aluminium almost as well, although not quite so well as copper, possessing the additional advantage that only a small quantity of it is necessary in order to get the wished-for strength and hardness, these being very desirable qualities.

The amount of magnesium which is usually employed for making an aluminium and magnesium alloy is about 10 per cent. More magnesium gives a greater degree of hardness. To make such an alloy, the following mixture is made: 90 parts by weight of aluminium and 2 to 5 parts of magnesium.

If the alloy is to be rolled into sheets or drawn into wire, less magnesium must be added; as a rule, 2 to 5 per cent. The addition of 2 per cent gives a soft alloy; 5 per cent a hard one. The aluminium is to be melted in the ordinary graphite crucible. When it is melted there should be added a trifle of cryolite, a mineral containing aluminium, fluorine, and sodium. This covers the surface of the aluminium, and protects the magnesium from oxides when it is melted. The latter is thrust down through the aluminium by tongs, so that it melts and alloys itself with the latter, without coming in contact with the air. All being next well stirred, it is then ready to be poured. The usual precautions as regards overheating and pouring are to be observed, as in the case of aluminium and zinc alloys. The temperature for the pouring is about the same as that for the other aluminium alloys. The tensile strength of the aluminium-magnesium alloys is not so great as that of aluminium and zinc, but is about the same as those of aluminium and copper.

The great advantage in the employment of magnesium as hardening material for aluminium is in the very slight weight of the alloy, which unites the hardness of brass with the tensile strength of cast iron. Such alloys are especially useful in the manufacture of scientific apparatus and other instruments of precision.

A Hint for Inventors.

During the inspection trip of Colonial Secretary Dernburg in Africa, while the committee was at dinner at Bukoba, Herr Schubert, a manufacturer from Zittau, Saxony, announced that he intended to give a prize of 3,000 marks ($714) to the inventor of a method of utilizing the juice of the *Candelabra euphorbia*. The discovery of such a method affords many difficulties, but upon the proof of the ability to utilize this product, as well as other up to the present time unnoticed treasures of the colony, the 3,000 marks will be given.

The city of Paris owns 87,000 trees, or one to every thirty-two inhabitants, without counting the trees in some 300 acres of parks. The horse chestnut is the commonest tree planted by the municipality; after it comes the plane tree. In some of the more distant and secluded avenues limes and acacias are found, but variety must not be sought outside the gardens and parks which belong to the State. There one may find almost every tree that may be grown in the Paris climate.

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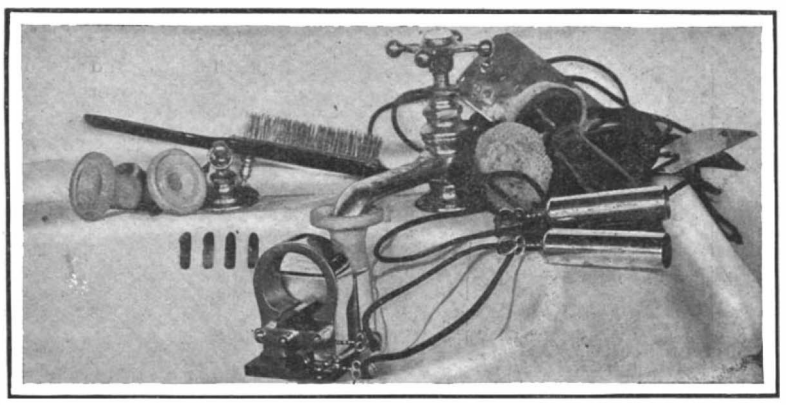
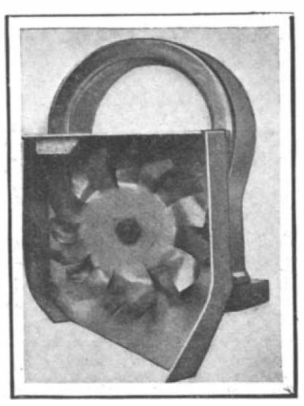
Patent Department

A FAUCET CONNECTION FOR GENERATING ELECTRICITY.

A very neat little machine has recently been devised, which may be attached to an ordinary faucet to generate electric current for electro-therapeutical purposes, thus taking the place of the common medical coil with its troublesome batteries and interrupter. As the accompanying illustrations indicate, the device consists of a small water motor directly connected to a magneto. The casing of the water motor has been removed in one of the illustrations to show the water wheel, which is stamped out of metal and shaped to form a series of alternately disposed buckets. Threaded into the casing above the wheel is a nozzle formed with a rubber cap, which may be fitted to a faucet, as shown in the other of the illustrations. By means of the nozzle the water is directed in a jet against the buckets of the wheel, rotating the latter at a high speed. The water wheel is secured to the armature shaft of the magneto which it drives, thus generating a rapidly alternating current, which is taken off a commutator by means of a brush. Connections are made with the brush plate and with the magneto frame to a pair of hand electrodes, which may be used in the ordinary way. The power generated by this little device is surprisingly high. The average city water pressure is amply sufficient to produce all the current which a person would care to take. Where the water pressure is very high, it will not be advisable to turn on the faucet to its fullest extent. A number of rubber cups are provided with each instrument, to permit of attaching the device to different sizes of faucets. In addition to the hand electrodes a brush is provided with wire bristles, which may be used in electrical treatment of the scalp. A pair of sponge electrodes are also furnished, which may be used in the treatment of the skin. By means of a pair of plates placed in opposite ends of the bathtub, one may take an electric bath. The quantity of electricity may be easily regulated by turning the faucet. This appliance is controlled by Mr. Francis E. Sheldon, 949 Broadway, New York, N. Y.



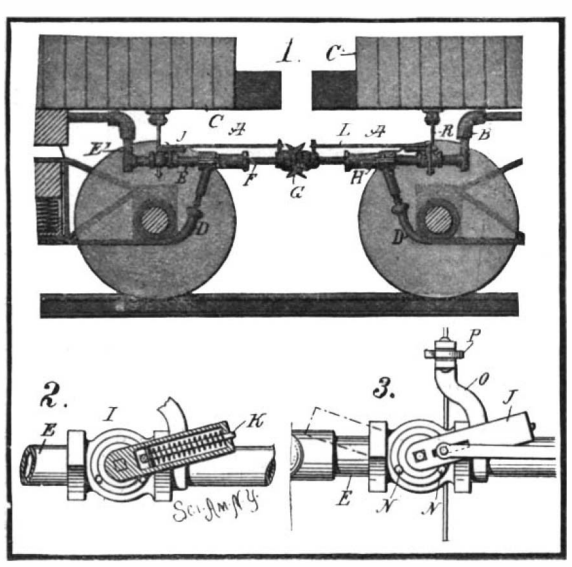
THE GENERATOR CONNECTED TO A FAUCET AND THE VARIOUS ATTACHMENTS USED IN ELECTRIC TREATMENTS.



CASING REMOVED TO SHOW WATER WHEEL.

AUTOMATIC COUPLING FOR BRAKE PIPES.

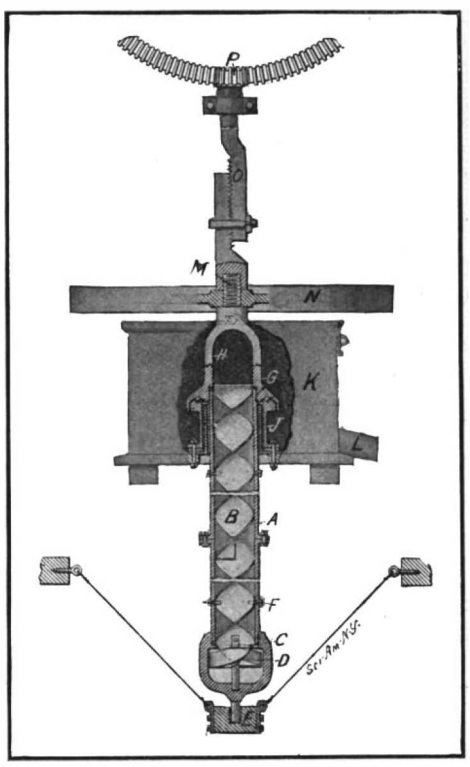
Pictured in the accompanying engraving is an improved coupler arranged to automatically connect the air-brake pipes of railroad cars while in the act of coupling the cars, to form a continuous passage for the flow of compressed air from one car to another without danger of leakage. The apparatus also comprises means for closing the air-brake pipes whenever desired, as when making up a train. The couplers *A* on each car are of light construction and are yieldingly connected to the train pipes *B*, which are attached to the under side of the cars *C*. Each coupler is supported by a bracket *D*, attached to the spring plank of the car. Each coupler is provided with air-pipe sections *E* and *F*, of which the pipe section *F* has an airtight joint with and telescopes in the pipe section *E*. The latter terminates in an upwardly-extending tubular pivot *E'* on the end of the train pipe *B*. The forward end of each section *F* terminates in a coupling head *G*, formed with prongs and adapted to engage a similar coupling head on the opposite pipe-coupler. A rubber packing is arranged in the mouth of each pipe *F*, and is adapted to form an air-tight joint when the couplers come together. The joint between pipes *E* and *F* is inclosed in a casing *H*, which is formed with a spring serving to press the pipe *F* out to its fullest extent, and thus hold the head *G* in engagement with the head of the opposite coupler. Near the rear end of each pipe section *E* is a plug valve *I*, which is best shown in Figs. 2 and 3. This plug valve is formed with a hollow lever *J*, containing a rod *K*. One end of the rod *K* is bent upward, and projects through a slot in the side of the lever *J*. To this projecting end a link *L* is attached, which connects with a pin on the coupler head. When the cars come together the coupling heads are forced backward, and this motion is communicated by means of the link *L* and lever *J* to the plug valve *I*. The plug valve is so arranged that it is open when the cars come together, to permit free flow of compressed air through the brake pipes, and it is also opened when the cars separate, so that in case of a train breaking in two, the air will escape from the pipes and set the brakes. In order to prevent the brakes from operating when the train is being made up, a catch is provided, which will hold the plug in an intermediate position when the cars are uncoupled, thus closing the brake pipes and preventing the air from flowing out. This latch is shown at *P* pivoted to a bracket *O*, secured on the pipe section *E*. The latch *P* engages the lever *J*, preventing it from turning past the central position when the cars are uncoupled. The latch is controlled by a pair of hand levers *R* on each side of the car, and may be readily thrown into or out of operative position. Mr. Charles Albert Marshall, box 1173, Tulsa, Ind. Ty., has just secured a patent on this improved brake-pipe coupling.



AUTOMATIC COUPLER FOR AIR-BRAKE PIPES.

WATER ELEVATOR FOR WINDMILLS.

In the accompanying engraving we illustrate a new form of pump or water elevator adapted to be used in connection with windmills in place of the ordinary reciprocating pump. The elevator is so designed that the motion is purely a rotary one, thus avoiding the jerking motion that is so destructive in the ordinary pump. The water elevator can with safety be run at the highest speed at which the windmill can operate, enabling all possible advantage to be taken of strong winds. It will be observed that the elevator comprises a tubular body *A*, in which a double screw elevator *B* is fitted. The tubular body and the spiral elevator are made up of sections, which are bolted or riveted together. The body *A* and screw *B* are adapted to turn as one piece, and hence are fastened together by screws *F*. The lower end of the tube *A* is screwed into a bearing terminal *C*, which is formed with a pin that enters a socket piece *E*. To prevent swaying when the elevator is in motion, the socket piece is guyed to the sides of the well. The spiral elevator *B* projects into the bearing terminal *C*, and is formed with scoops *D* adapted to lift the water into the screw when the latter is rotated. At the upper end the tube *A* is threaded into a U-shaped member *H*, which rests on a ball bearing *J*. The U-shaped member *H* is threaded into the end of a shaft *M*, which is flattened at its upper end and provided with a serrated surface adapted to engage a similar serrated surface on the shaft *O*. The shafts *M* and *O*, after being properly adjusted with respect to each other, are fastened together by means of a U bolt. The power of the windmill is conducted to the shaft *O* by means of gearing *P*, and serves to rotate the elevator, which raises water on the principle of Archimedes's screw. The water rises to the top of the screw, whence it pours through the U-shaped member *H* into the reservoir *K*, and thence through the outlet *L* to the desired point of application. A fly-wheel *N* serves to balance the motion of the elevator. A patent on this water elevator has been granted to Mr. Albert Haas, of 4 State Street, Flushing, N. Y.



WATER ELEVATOR FOR WINDMILLS

IMPROVED DITCHING PLOW.

A recent invention provides an improved ditching plow, especially adapted for digging tiling sewer ditches or draining ditches. The device is of very simple construction, and capable of effective service in any character of soil. It is especially adapted to be drawn by a traction engine or capstan. As shown in the engraving, it comprises a beam *A*, which extends forward and with an upward inclination from the cleaner *B*. The latter is triangular in shape, being provided with two diverging wings. The purpose of the cleaner is to travel over the surface of the ground, and remove the excavated material from the edges of the ditch. The beam *A* is hinged to the cleaner, so as to provide for a certain amount of vertical motion. Below the beam and forming an angle therewith is a blade *C*, provided with a cutting edge at its lower end, which serves to enter the earth more or less deeply as the plow is drawn forward, and carry the excavated material to the surface. At its forward end this blade is braced by means of a support *D*, which is fastened to the beam *A*. At the forward end of the beam *A* is a clevis bar *E*, which is secured at its upper end to draft bar *F*, extending to the rear of the beam *A*. In this clevis bar are a series of apertures adapted to receive a link to which a pulley block is connected. This block serves to receive the cable that is passed to the windlass or drum of the traction engine, for the purpose of drawing the car forward. Owing to the lightness of this plow, it may readily be loaded upon a truck and transported from place to place. A patent on this implement has recently been secured by Mr. Charles T. Howell, of Glen Flora, Wis.

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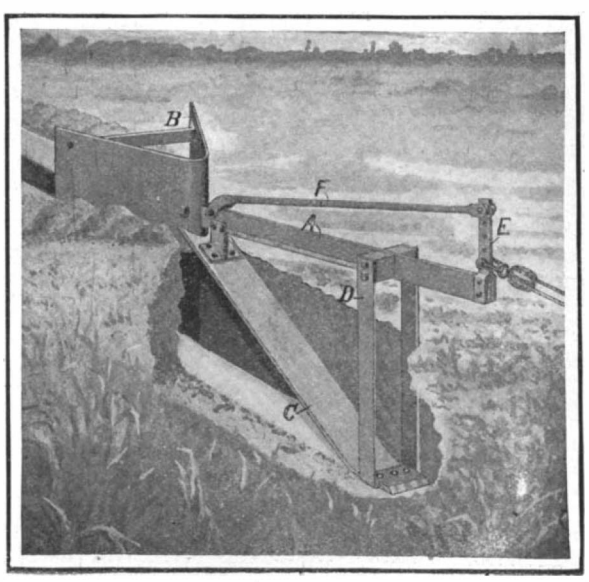

IMPROVED DITCHING PLOW.

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RECENTLY PATENTED INVENTIONS.

Of Interest to Farmers.

HARROW ATTACHMENT FOR PLOWS.—J. C. FOOSHE, Ninety-Six, S. C. The purpose of the invention is to provide an improvement upon the construction of the harrow attachment for which Letters Patent were formerly granted to Mr. Fooshe. A winged shovel is employed and two disk cultivators are supported at each side of the beam arranged to cultivate those portions of two rows of plants adjacent to the roots which the shovel does not ordinarily reach. This is done while the shovel operates upon the central portion of the furrow between said rows. Thus all ground is furrowed from center to roots of plants, upturned and loosened, and work accelerated of cultivating large tracts of planted ground.

Of General Interest.

AIR-COMPRESSING SYSTEM.—A. SAUER, Pittsburg, Pa. In this patent the invention relates to compressing air apparatus designed to produce a pressure of aeriform fluid which may be utilized in the performance of useful work, such as running machinery, for ventilating buildings and dwellings, and for the production of gas for illuminating purposes.

ATTACHMENT FOR DRAFT-HARNESS.—W. E. PERRY, Warrensburg, N. Y. Ordinarily the heavy leather harness is liable to change its position on the rump and haunches of the animal while the beast is pulling. This movement of the hip strap, back strap, and breeching creates friction that frequently produces sores that greatly irritate the animal, and from their position difficult to heal. This invention prevents all abrasion and injury.

STRAP-FASTENER.—G. A. MAINS, Thompson, Mont. The invention is especially designed for use in securing mail pouches, such as are commonly used in carrying United States mail. The construction is simple, easily applied for use, can be readily operated to permit tightening of the straps around the neck of the pouch to any desired extent, and may then be easily closed and locked.

ORE-ROASTER.—A. J. GARVER, Clarkston, Wash. In this patent the invention refers to roasters of the kind used in treating ores, and more particularly ores containing sulfur. It is of simple form, self-feeding, self-agitating, and self-emptying. A fireproof cylinder is provided with spiral conveyer threads for the purpose of more efficiently handling the ore.

RUBY-PIN SETTER.—C. A. SLOAN, Ozark, Ark. The object in this case is to provide a setter, which is simple and durable in construction and arranged to permit convenient, quick, and accurate setting of the ruby pin in the roller table of a balance, without requiring removal of the hair spring or the roller table from the balance staff, and to permit use of the device for any size balance staff.

Hardware.

ALARM DEAD-LOCK.—M. SHEINMAN, New York, N. Y. This invention has reference to improvements in alarm locks for doors, the object being to provide in connection with a lock a simple means for closing an electric alarm circuit should an attempt be made to force open the locking bolt from the outer side of the door by means of a knife blade or similar instrument.

WRENCH.—A. S. PEARCE, San Juan, Cal. The object of the inventor is to provide a wrench by means of which a nut may be easily removed from a vehicle axle and which can be operated by the turning of the wheel which is secured upon the axle by the nut. It grips a nut and at the same time engages with the wheel-hub so that the nut is unscrewed by turning the wheel in one direction, and may be screwed back upon the axle by turning in the opposite direction.

Household Utilities.

CLOTHES-DRIER.—S. E. WILSON, Franklin, Ky. An important feature of the invention is the relation of the hinges to the several bars and to the end battens as it provides a rigid drying frame when the parts are adjusted for use and yet permits of the folding of the parts of the frame when the latter is collapsed. The rack may be made in different sizes. Clothing, large sheets, or other large articles are absolutely protected from rust when hung on any part of the rack.

SASH-FASTENER.—G. A. ORR, Cripple Creek, Col. In the present patent the improvement pertains to sash fasteners, and the object is to produce a fastener which is controlled by gravity, but which is constructed in such a way as to prevent the fastener from becoming released except by a force applied at the operating lever.

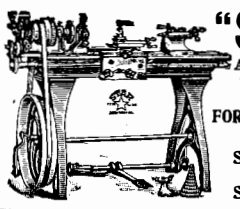
Machines and Mechanical Devices.

BUILDING-BLOCK MOLD.—C. J. T. CORDES, Waldwick, N. J. The object of the invention is to produce a machine simple in construction and intended to mold divided building blocks. The improvement relates to molds or molding machines for forming building blocks of concrete or similar material, and the machine may be readily operated by one man.

Pertaining to Vehicles.

DUMPING-WAGON.—T. WRIGHT, Jersey City, N. J. The improvement pertains to a novel manner of mounting the bed of a wagon, particularly of a dumping wagon, upon the rear axle. The object is to distribute the load on the vehicle as fully as possible, and to provide a set of springs which will be more durable and efficient than those heretofore used.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.



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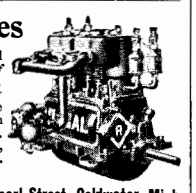

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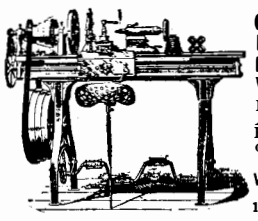

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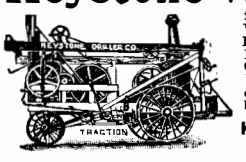

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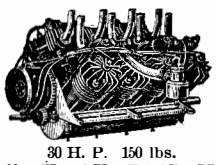

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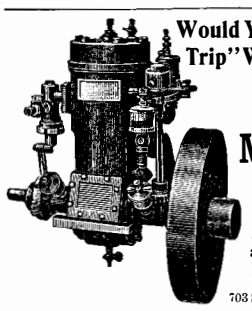

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending November 12, 1907.

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Account register, Staples & Potter..... 870,594
Addressing machines, type-carrying belt for, F. A. Harrison..... 870,778
Advertising device, R. Wightman..... 870,705
Aerial machine, B. Connolly..... 870,936
Alarm. See Burglar alarm.
Alarm box attachment, L. G. Holden..... 870,963
Amalgamator, G. E. Paullins..... 870,643
Annealing box, J. B. Henry..... 870,558
Anti-rail spreading device and gage, Z. L. Pierce..... 870,842
Antisiphon trap, J. C. Lauth..... 870,733
Apple box press, J. McCaughan..... 870,683
Arch supporter, C. L. Austin, Jr..... 870,661
Automobile attachment, Z. G. Sholes..... 870,908
Automobile roadway, L. S. Hackney..... 870,775
Automobiles, means to record the speed of, W. A. Cheesebro..... 871,002
Axle box cellar, F. B. Harrison..... 870,953
Axle lubricator, A. B. Day..... 870,944
Axle wheel coupling, J. H. Snuggs..... 870,853
Bag holder, W. M. Renne..... 870,687
Bait, artificial, W. E. Davis..... 871,057
Bank, portable, J. B. Poore..... 870,843
Barium oxid, producing porous, H. Schulze. 870,691
Barrel follower, C. Kuheim..... 870,729
Base board, A. M. Bryan..... 871,028
Bath apparatus, J. B. Stockton..... 871,074
Baths, etc., head for shower, W. Attlesey. 870,924
Beam, reinforced steel, E. Swensson..... 871,075
Bearing, F. W. Schoenberger..... 870,799
Bearing, shaft, F. T. Zimmerman..... 870,810
Bed, G. W. Bent..... 870,663
Bed canopy, C. D. Brumley..... 870,541
Bed pan, Meinecke & Hogan..... 870,984
Beer tapper, R. B. Spikes..... 871,073
Beeswax separator and purifier, G. B. Savage..... 871,046
Belt clamping tool, B. T. Fritts..... 871,062
Bicycle, motor, F. P. Lindley..... 870,834
Binder, temporary, L. M. Morden..... 870,837
Blind, awning, G. W. Pearson..... 871,044
Boat, C. H. Myers..... 870,738
Boat, life, R. A. Brown..... 870,928
Bobbin holder, J. Pearson..... 870,743
Bobbins, apparatus for applying expansible rings to, Hodgman & Bailey..... 870,960
Boiler cleaner, I. C. Gray..... 870,773
Boiler cleaner, steam engine, I. C. Gray... 870,774
Boiler tube-scarfing machine, Meyers & Loudenslager..... 870,734
Boiling and distilling apparatus, R. Planckh 870,747
Bolt lock, O. Cullman..... 870,547
Book handle, R. Hinckley..... 870,958
Book, painting, R. H. Garman..... 870,771
Bookcase and folding bed, combined, W. Freedman..... 870,947
Boot cleaner, A. C. Houghton..... 870,679
Boot or shoe, F. W. Homan..... 870,783
Boring bar, W. Chase, Jr..... 871,031
Bottle, D. J. Higginbotham..... 870,956
Bottle attachment, non-refilling, E. J. Clayton..... 870,932
Bottle stopper, J. A. Moller, Jr..... 871,041
Bottle washing machine, P. D. Laible..... 870,730
Box filling machine, A. L. F. Mitchell..... 870,895
Braiding machine, F. Thun..... 871,004
Brake block, Blair & Scanlan..... 870,711
Brake operating mechanism, G. C. Wartman..... 870,707
Bread cutter, Hassell & Cunningham..... 870,626
Broom, W. Fanckboner..... 870,717
Bucket and operating mechanism, grab, H. P. Andresen..... 870,812
Bucket, combined feed and water, J. F. Alexander..... 870,660
Burglar alarm, H. R. Lassen..... 870,732
Button, I. Kalliwoda..... 870,725
Button, E. Shantz..... 870,907
Buttonhole strip, L. S. Newcomb..... 870,988
Cabinet, compositor's bracket, F. J. Walker 870,601
Cabinet, disappearing table, W. H. Carroll. 871,084
Cabinet, ironer's, L. R. Trager..... 870,805
Camphene, manufacture of, F. Koch..... 870,829
Candlestick lubricator, E. L. Faul..... 870,875
Candlestick, miner's, G. D. Neill..... 870,638
Cane mill roll, sugar, Aitken & Mackie.... 871,018
Car, mine, E. C. & F. L. Callahan..... 870,542
Car mover, J. S. Mullenix..... 870,987
Car roof, W. N. Garrett..... 870,721
Cars, three-point contact trolley timer for internal combustion motor, G. M. Hurley..... 871,064
Carpet stretcher, I. Freed.....870,670, 870,671
Carriage handle, adjustable and reversible baby, J. J. McIntyre..... 870,739
Carriage top bow separator, A. H. Veazie. 871,010
Cash carrier, cable, G. A. Amsden..870,756, 870,757
Cash register, H. S. Hallwood..... 870,624
Cash register, multiple drawer, H. S. Hallwood..... 871,094
Caster, furniture, C. F. Mosman..... 870,791
Casting machines, apparatus for holding and pouring metal into molds for, E. A. Custer..... 870,869
Cattle treating apparatus, J. B. Eaton..... 870,766
Cement structures, means for supporting reinforcing rods for, A. Witte..... 871,017
Centrifugal machine, L. P. Willsea..... 870,655
Chain, J. H. Weston..... 870,704
Chair. See Reclining chair.
Chair and couch, combined, J. M. Hamilton 870,776
Chair and garment support, combined, J. F. Fairbanks..... 870,874
Chair fan attachment, rocking, D. J. Stein. 870,911
Chimney construction, W. C. Hays..... 870,780
Chimney cowl, M. Ludwig..... 870,976
Christmas tree support, J. Vogt..... 871,050
Chuck mechanism, A. Tindel..... 871,005
Cigarettes with tin-foil or the like, apparatus for wrapping, A. Godfrey..... 870,623
Circles, instrument for use in determining the functions of, A. S. H. Hitchings... 870,959
Circuit closing device, time controlled, Palmgren & Young..... 870,900
Clasp, R. Falter..... 870,617
Cleaning system, vacuum, Matchette & Raddatz..... 870,981
Clock, F. R. Alford..... 871,019
Clock, workman's, C. L. Goughnour..... 871,087
Closet seat, F. H. Lindenberg..... 870,833
Closet tank, F. H. Lindenberg..... 870,832
Clothes line prop, F. M. White..... 870,752
Clothes line stretcher, C. R. Fish..... 870,944
Clothes pin, W. D. Watkins..... 870,703
Clutch, P. Daniel..... 871,033
Clutch, friction, A. Oskamp..... 870,642
Clutch, mechanical, J. D. Taylor..... 870,912
Coal handling device, E. E. Barrett..... 870,609
Coating disks and similar articles, apparatus for, Macdonald & Capps..... 870,569
Coffee refresher and polisher, E. C. Prieto. 871,045
Collar, dog, G. Huff..... 870,784
Column, reinforced steel, E. Swensson..... 871,076
Combination instrument, C. Schneider..... 870,851
Communion cup, O. V. L. Harbour..... 870,556
Composing machine, L. Allen..... 871,020
Concrete mixer, A. W. Ransome..... 870,797
Concrete structure, reinforced, A. Rogers... 870,588
Conduit sections, apparatus for alining, J. T. Rice..... 871,067
Controller, F. W. Garrett..... 870,555
Controller, L. L. Tatum..... 870,595
Converter, R. Baggaley..... 870,925
Converters and furnaces, means for increasing the air blast of, R. Baggaley, et al. 871,079
Conveyer, C. Bradford..... 870,614
Cooking utensil, L. G. Fagersten..... 870,873
Cooling bed and conveyer, J. A. Smitmans. 870,592
Copper, obtaining pure, L. Jumau..... 870,786
Copy holder, H. E. Penney..... 870,991
Copying press, E. Eulenstein..... 870,553
Cork extractor, R. O. Toan..... 871,006
Corn-shelling machine, J. A. Wilkinson.... 870,919
Cotton chopper, G. M. Head..... 871,035
Cover closure, F. Bredel..... 870,540
Crutch, E. E. Hayden..... 870,676
Culinary utensil, H. F. Hall..... 870,880
Cultivating tool, H. R. Hilton..... 870,957
Current generator, alternating, G. H. Cove. 870,938
Current meter, alternating, R. C. Lanphier. 870,970
Current motor, alternating, R. Lundell, 870,892, 870,893
Cutter-head setter, J. W. Winningham..... 871,053
Dam, W. L. Church..... 870,930
Dam, H. L. Coburn..... 870,934
Dams, building, W. L. Church..... 870,866
Dental articulator, G. B. Snow..... 870,909
Dental engine handpiece, J. F. Hardy..... 870,824
Dental handpiece angle attachment, J. F. Hardy..... 870,825
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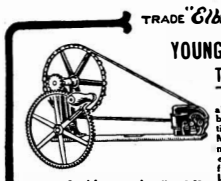
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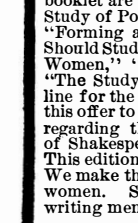
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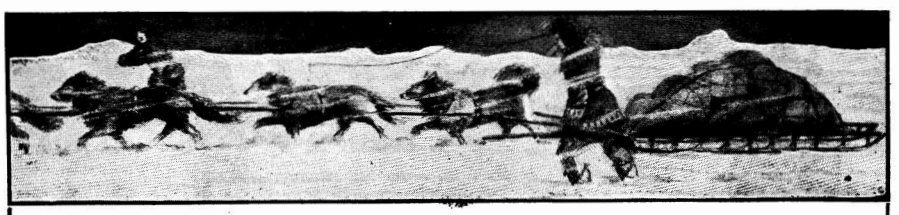
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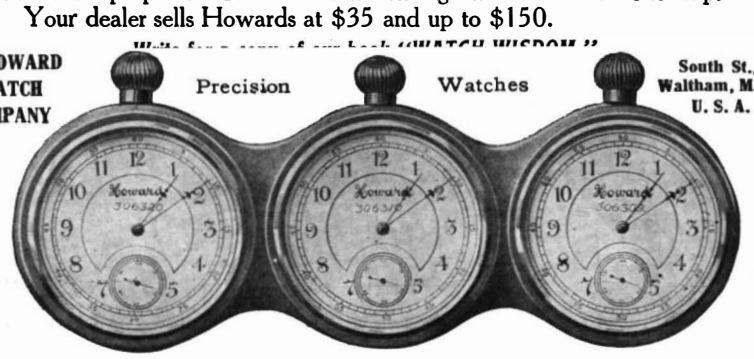

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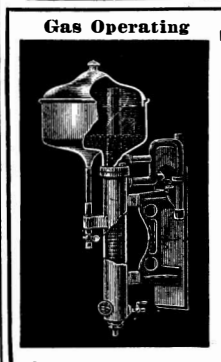
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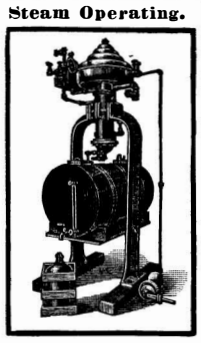
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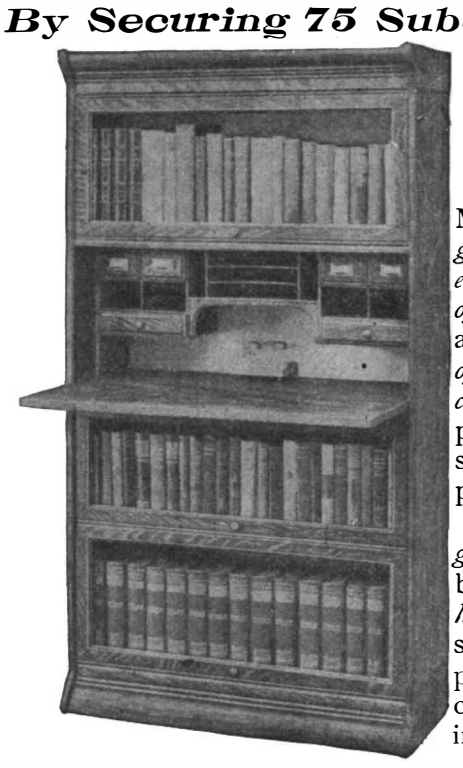

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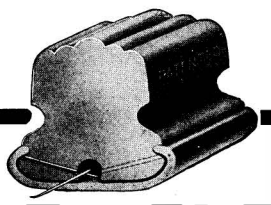

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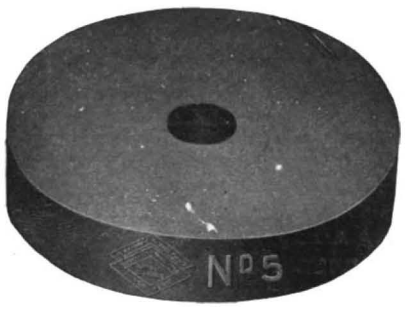

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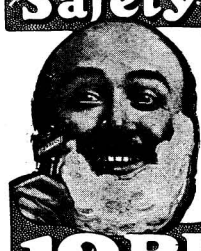

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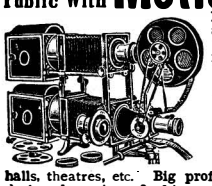

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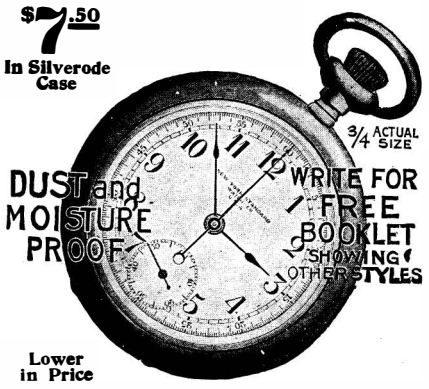

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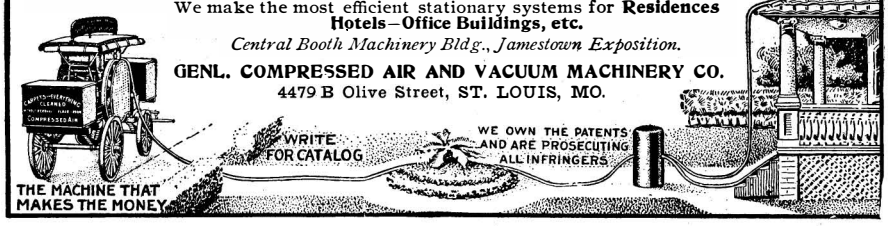

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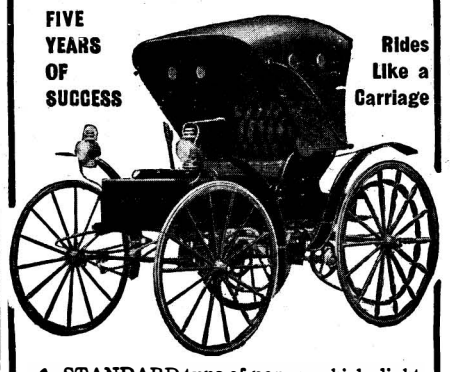

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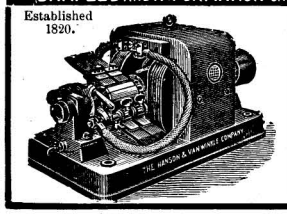

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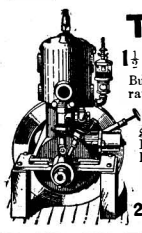

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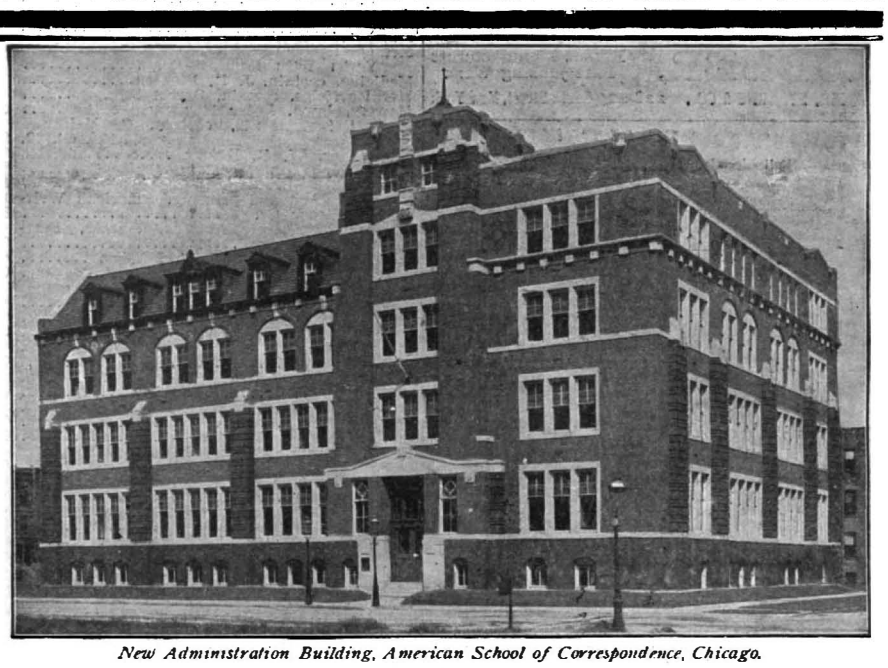

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